

This German submarine, one of the largest type used by the Teutons for long range cruises, is shown stopping a Spanish mail steamer. Insert shows two dangerous "ladies" aboard one of Uncle Sam's dreadnoughts. This is a stern view of two big U. S. torpedoes

Photographs by  
International  
Film Service



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## August 1918

**MoToR  
BoatInG**

SCIENTIFIC MECHANICS

AIR BOATING

Vol. XXII, No. 2

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writing us, for by that time it will probably be in their hands.



### Great Lakes Boat Building Corporation's Facilities Entirely Devoted to War Work

**F**OR the duration of the War it will be impossible for us to build any more Great Lakes Standardized Express Cruisers, as the entire capacity of our plant and organization is devoted to War Work—and will continue to be just so long as the Government has work for us to do. In between the time we finished the 110 Footers last year for the Navy Department and the starting of our contract for Airplane Propellers we built a number of our Fifty and Fifty-Two Foot Standardized Express Cruisers.

A limited supply of both of these sizes are now on hand, completely equipped and ready for immediate delivery. When the boats on hand are sold it will be impossible to obtain others until after the War is Won.

*Write or Wire for additional data and illustrated booklets.*

#### GREAT LAKES BOAT BUILDING CORPORATION

Milwaukee, Wis.

*Designers and Builders of Boats of Distinction and Quality.*



Scientific  
Mechanics

Air  
Boating



Photograph by International Film Service

*This Handley-Page airplane is of British design but of American manufacture and the materials are from America. This is only the first of a wonderful fleet of planes which are now in the course of construction. The Liberty Motor is one of the most powerful ever built. She was christened Langley in honor of Professor Langley*

## A Look Into the Future

A New Magazine to Be Known as Scientific Mechanics to  
Include Motor Boating Beginning With the October Issue

**T**HE next issue of MOTOR BOATING will be combined with the October issue of a big, new, popular mechanical magazine to be known as Scientific Mechanics. This October issue of Scientific Mechanics will be out and in the reader's hands throughout the country on September 10th.

Many of the readers of MOTOR BOATING have probably noticed the added interest which has been given to our pages during the last few months, without the real boating interests being curtailed in the slightest. The sport and industry of motor boating is here to stay and after the war, unless all signs fail, activities on the coastwise and inland waters of the country will be renewed on a scale never before attempted. Many of our subscribers have written to us approving of the broadened field and the change in scope of MOTOR BOATING and have assured us of their continued support and interest. So hereafter motor boating will be one of the many branches which will be given intensive attention.

Naturally in taking up these new fields, the name MOTOR BOATING would not convey the proper idea of our intentions or ambitions. Therefore, the name Scien-

tific Mechanics has been decided upon. This title seems to best describe our many and practically unlimited resources for the production of the most interesting and popular mechanical and scientific publication ever printed.

It will be remembered that mechanics is that branch of physics which deals with force or motion and their effects upon material bodies. In its popular sense, mechanics refers to the application of force or motion as in machines or mechanisms. Science means classified knowledge. Scientific therefore means an orderly or systematic method of studying or applying knowledge or facts. Neither mechanics nor science, when considered individually, implies any definite accomplishment. But when applied together they become the foundation of the world's progress.

Scientific mechanics describes the systematic application of mechanical laws to achieve a definite result. Scientific Mechanics, as the name of a magazine, suggests a systematic analysis of mechanics and mechanisms, considering the results accomplished and the means of achieving those results.

(Continued on page 88)

# Aviators of the Allies

© Photographs by International Film Service



The illustration above shows a Maorane Saulnier airplane used by the French for taking photographs of enemy positions. Although these planes carry two motors, they are lightly constructed and very fast. The front is provided with holes through which the photographs are taken

As some of our boys in France are flying in French airplanes somewhat different in detail from the American-built machines in which they were trained, it was first necessary to familiarize them with their new machines. The illustration shows a French instructor busy at this work



These members of the British Royal Flying Corps resting behind the lines do not appear worried over future encounters with the Bosches. It is such men as these that have been so successful in all the aerial operations carried on over and behind the German lines



One of the types of fighting plane used by the British Royal Flying Corps with great success in the recent operations in France. These planes are armed with two Lewis machine guns on a specially designed mounting that makes them particularly deadly

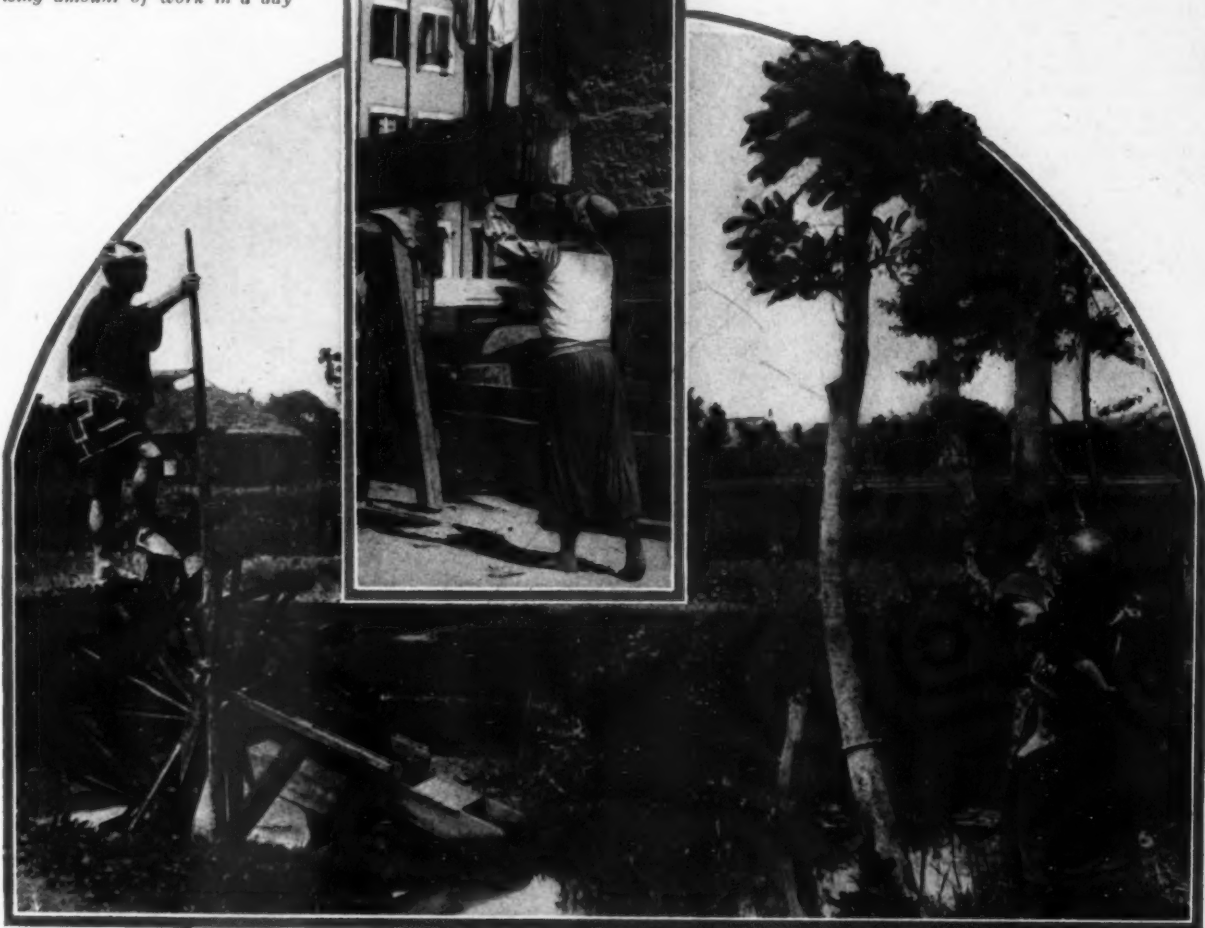


## Mechanics in the Far East

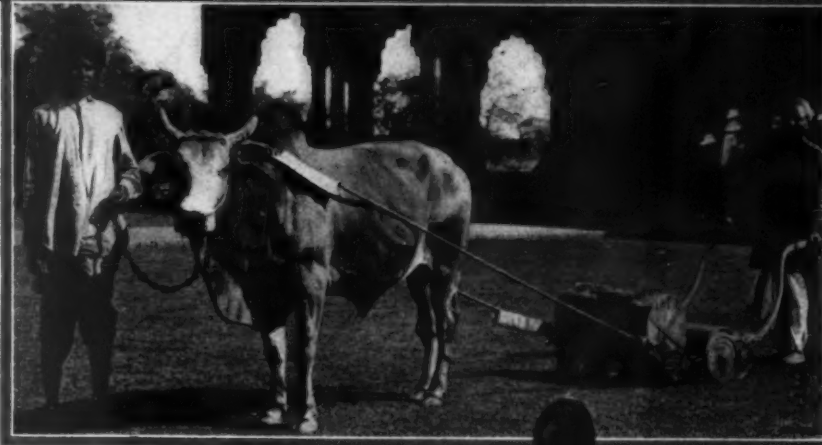
*An Egyptian man-power saw mill. Modern saw-mill machinery is so scarce in Egypt that most of the lumber which is sawed in the country is gotten out by hand like this. The method is primitive in the extreme—even the saw is home-made yet two good Arab sawyers can turn out a surprising amount of work in a day*



*An ingenious water wheel constructed and used by the Japs to raise water a few feet to irrigate the fields. Simplicity of construction and ease of operation are the outstanding features of this machine. Any member of the family can run it as experience is not required*



*Mowing the grass before the Pearl Mosque in Delhi, India. An American lawn mower is used, drawn by one of the "cebu" or humped oxen of India. This strange*



*mixture of the old and the new, the east and west is getting to be an every day occurrence throughout Asia, where American commerce is pushing its way to the front*

*A Japanese shoe-maker producing custom-made shoes while you wait. The leather shortage never bothers him for the reason that there is no leather in his shoes. The shoe consists of a wooden sole, two blocks fore and aft on the bottom to make it easier to fall down—so it would seem—and a band across the top under which the foot is slipped. The first and second toe go around the peg in front to get a good grip on the situation and the job is finished. An ax is his principal tool and if the shoes should be too large he will cut them down*



# Gas Masks Over Here and Over There

The Battlefields of Europe Are Not the Only Place Where Men Must Work in Poisonous Gases

**I**T was not until the Hun let loose the chlorine and other poisonous gases on the battlefield that the subject of poisonous gases and masks to protect the wearer from their effects became a subject of general interest.

As a matter of fact gas and dust excluding masks are not a new invention. For a number of years the Bureau of Mines, Department of the Interior, has maintained a rescue corps for emergency work in the coal mines. Although their equipment is elaborate and includes a complete hospital and mine fire-fighting apparatus, it would be practically useless were it not for the gas masks that enable the members of

the corps to enter the gas-filled mines and rescue any of the miners who may still be alive. The fire departments of several large cities include in their equipment smoke helmets to enable their men to enter smoke-filled buildings and more effectively fight the fire.

Men operating emery dust-producing machinery protect their lungs by wearing masks that exclude the fine dust, while workers in many branches of the chemical industry wear masks to remove the poisonous fumes.

© Photographs by Kadel & Herbert



*A Salvation Army lassie ready for the battlefield. The air inhaled passes through the chemically treated fabric that excludes the poisonous gases*



*Mask for use in gas that does not effect the eyes but is injurious to the lungs*



*A mask worn in some factories to protect the workers from fine dust*



*Type of mask used by fire-fighters*



*A mask worn by water-works employees where the water is treated with chlorine in the process of purification to remove bacteria*

## Going Up!

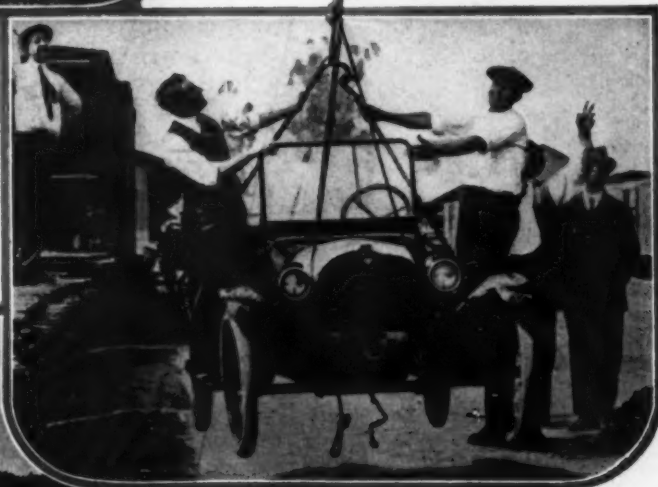


© Photographs by Kadel & Herbert

To prove his statement that the inner tubes he was selling would lift an auto, the agent actually performed this stunt and it is not surprising that he sold his goods to this customer.

The car was driven to a place where some construction work was going on and a lifting derrick could be pressed into service, a heavy chain was put around the auto and hooked to the inner tube, which was slung over the large hook of the lifting derrick. The agent and the man whom he wanted to convince stepped on to the running board as the auto left the ground, adding about 250 extra pounds to the weight, which totaled 1,540 pounds. The inner tube was not injured by this severe test

The New York Police Department have commenced placing sirens on the roofs throughout the city to warn the inhabitants of Boche airplane raids. The illustration shows a type of double siren that has been approved by the Signal Corps, United States Army, for this purpose. Sirens will be placed throughout the city and will all be operated by one main switch at Police Headquarters



An odd accident occurred in California where the railroad passes under a steep and high bank. As the locomotive passed the jar of the heavy machine started an avalanche which buried the engine almost to the smoke stack, leaving it upright. As luck would have it the door was not covered, so that the engineer escaped without any injury, but well covered with sand and gravel. The heavy California rains loosen this soil, and such a landslide is apt to occur

Riding horseback in an automobile is the latest idea from Boston, though it must be added that this is not a new form of sport but a novel idea in advertising. The construction of the vehicle is unique; a small pleasure car was stripped and upon the frame was placed a spirited reproduction of a race horse. It carries a bridle and light saddle, and upon the latter sits the jockey-chauffeur. Instead of stirrups, he rests his feet upon pedals that operate brake and clutch lever, while the steering is done by a wheel. In order to bring the wheel into a position corresponding with the reins, the post was lengthened and extended through the neck of the horse. The gear shift is placed inconspicuously beside the driver's left hand. With this combination of horse and car, the citizens of Boston received the surprise of their lives as the machine was driven through the downtown streets



## Short Cuts in Red Cross Work

Some Ingenious Machines Which Have Been Developed  
as the Result of This Patriotic Work of the Women



The most up-to-date electrical equipment is now employed by the Red Cross Workers to facilitate their work. Instead of using the old-fashioned pattern, these ladies mark out a design by means of a device which burns tiny holes

Many thicknesses of material, from which patterns are cut, are spread out evenly upon a cutting table by means of a "laying out machine." An electric cutting contrivance equipped with a 10-inch knife then cuts the cloth quick'y and smoothly



A sock knitting machine makes possible a great economy of time and labor. Instead of making thousands of movements with the elusive needles, the knitter merely turns a crank with one hand, and guides the thread with the other. The heel and toe are shaped in the machine

It requires very little skill with the needles to turn out a sweater by means of the knitting machine. To an ingenious arrangement of needles the zephyr is fed with great speed and the whole garment rapidly takes shape

Photographs by Brown Bros.

# The Science and Mechanics of Airplane Building

*Applying the "dope" that water-proofs and shrinks the linen covering of the wings*



**T**HE airplane is a miracle of mechanics. It is at once the speediest craft in the world and the most unsubstantial. More complicated in many respects than a locomotive or a steamship, it must be built to defy the laws of gravity. No other engines are expected to develop such power in proportion to their weight, so that every detail must be built almost with the accuracy of a watch. Gravity is a very exacting task master, and every part of the airplane must be brought in instant control of the pilot, since a delay of a second in carrying out an order may mean a fatal plunge.

So rapid has been the development of the airplane, especially during the war that the early models appear today almost as obsolete as the first steamboats or locomotives. The first Wright machine seems almost as primitive as Fulton's first steamboat. In place of the flimsy craft carrying a single passenger, the great air planes of today carry a score of passengers or tons of explosives. Their speed has increased from 40 to 140 miles an hour. In place of a precarious flight of a few minutes the bombing raids may cover upwards of a day while the mails are carried back and forth with amazing speed regularity.

Although the world has been ransacked for materials the airplane is still constructed almost wholly of wood. It has been found by thousands of tests that no other material com-

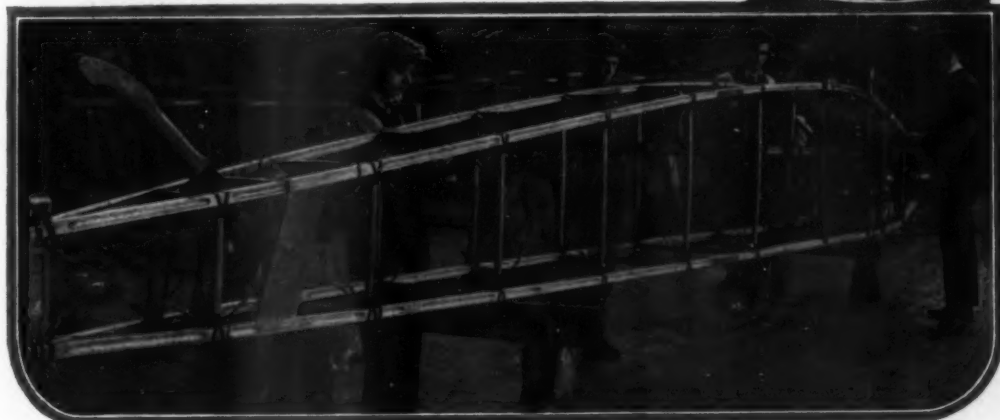
bines so much strength with extreme lightness. The best woods for the purpose are ash, hickory, spruce, black walnut, mahogany, and oak. The racking and vibration of an airplane in flight exerts a terrific strain, and only wood has sufficient elasticity to stand it. Any metal would granulate and crack. Hickory is found to have the greatest resiliency, and can be turned further without breaking than any other wood.

The layman cannot appreciate the difficulties of such construction. A wing or plane must bear the weight of several tons of machinery, guns, and ammunition, and yet be almost as light in proportion to its size as a kite. Their frames are designed with the greatest care to save every unnecessary ounce of weight. The accompanying illustration gives some idea of the delicacy with which the wings are designed and of the bracing which supports or resists enormous strains. The spars of these wings are built of spruce, the ribs of ash while the flanges on which the cloth rests are faced with hickory. Each of these woods is especially suited for the strain it must bear in this particular position.

The curves of the upper and lower surfaces of the planes must be mathematically accurate. It has been found by calculations and experiments just what curve or camber will carry the wing through the air with the least resistance, and every detail of the wings must be extremely accurate to preserve this line. The photograph of the fuselage of an



*Of all forms of the gasoline power plant the airplane motor is the most highly developed. It must be reliable under all conditions of atmosphere and altitude and develop a maximum of power for a minimum of weight*



*The framework of the fuselage is a marvel of strength and lightness. It is this frame that must take all the stress and strain incident to flying and landing as well as carry the weight of the motor, passengers, and equipment. The adjustment of the bracing requires very careful work to evenly distribute the strains*



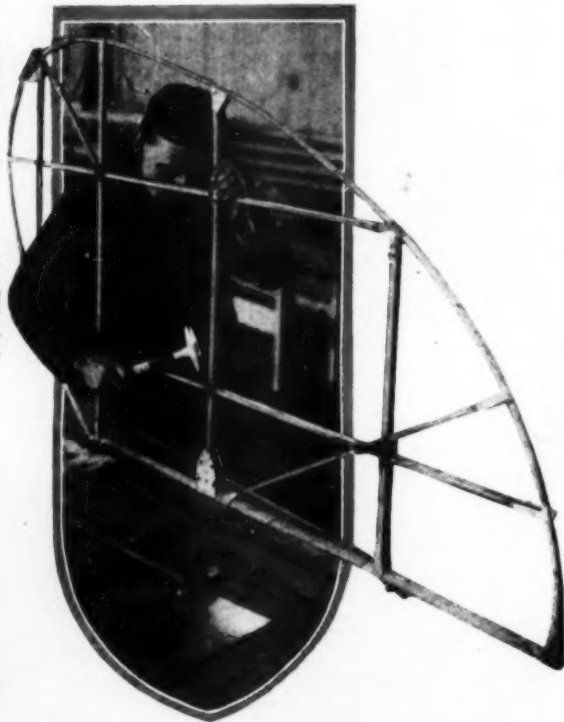
© Photographs by Brown and Dawson

airplane illustrates how very light is this construction and ingenious its detail. The bracing of the frame is especially effective. Although this fuselage would appear so frail that an able-bodied man could crush it, nevertheless it will support the weight of a motor, several passengers, and a number of bombs. It will be seen that the sides of the wooden strips are hollowed out in order to economize a few ounces in weight.

The delicacy of this construction is also clearly shown in the accompanying picture of a tail rudder frame. The frame with its braces seem scarcely more substantial than lead pencils, but it is nevertheless strong enough to withstand enormous pressure. It is this tail wing or rudder which must stand the strain of the wind pressure when a heavy airplane, traveling 100 miles an hour or more turns from

*The wooden framework of airplane wings is made up of many hundreds of small pieces, all securely fastened together, making a light but extremely strong structure over which to stretch the linen*

*The frame of the rudder is made up of small strips of wood reinforced at the intersections by metal plates. It is on the strength of this framework that the aviator must depend to control his craft*



*The airplane motor must be securely fastened to the fuselage so that there is no chance of it working loose as a result of the vibration. It is by these fastenings that the pull of the propeller is transmitted to the airplane's wooden frame*

side to side. If this rudder proves unstable the airplane is endangered, with the lives of those on board. It will be seen that the wooden parts of the rudder can weigh but a few ounces.

The covering of the wings or planes of the aircraft is a very delicate operation. A very fine grade of linen is commonly used. The mesh of the linen must be unusually close to prevent the air from passing through it, while the fabric must be proof against ripping or tearing under strain. A weight of several tons must rest upon this cloth, or rather be supported by its resistance to the air. Much depends upon the strength of these planes. If they break there is no hope for the aviator, for a plunge instantly follows. As long as the wings hold, even when the engine stops, there is no danger for the craft may volplane safely to earth.

When the covering has been stretched over both faces of the wings and tacked in position it is treated with a special preparation known in the trade as "dope". The ingredients used in this mixture and its preparation are carefully guarded. The main ingredient is usually

celluloid and banana oil. The visitor to this section of an airplane factory might imagine himself on a banana steamer, but the odor soon becomes sickening. The "dope" dries very quickly, leaving the surface tough and smooth. The surface may be compared to the smoothness and hardness of fish skin. It is very important that the surface of the wings offer the least possible resistance to the air. Every exposed part of the airplane is smoothed and varnished with the same end in view.

The building and installation of the motor is entrusted to skillful mechanics who have specialized in this work. The cylinders are usually cast in pairs so that if a flaw is discovered a large casting need not be discarded. A great deal is expected of such a motor. It must develop high speed, driving the airplane at a rate of 140 miles an hour or better, and be depended upon to run for hours without missing fire. An ordinary engine is firmly fixed on a base, while the aero engine must be adjusted to the frail body of the aircraft. The strain upon all the supports is enormous, but it is so ingeniously distributed that the airplane is not endangered.

## From Overseas



*The smooth and level fields necessary for airplanes to rise from and alight on are not always available behind the trenches. The American tractor shown in the illustration is leveling off a field for the American aviators behind the lines in France*



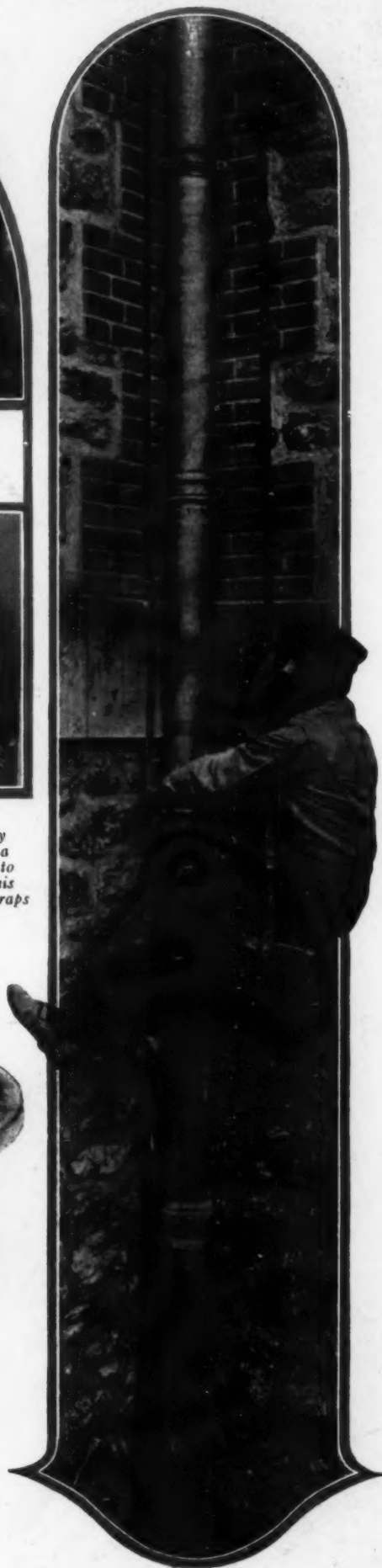
Photographs by Kadel & Herbert and Brown & Dawson

*Siberian architecture is more striking for its novelty than beauty. The hut shown in the illustration is built of logs, and with one exception the windows are made of sheets of ice held in place and made tight by frozen slush*

*American steeplejacks climb poles by means of two rope stirrups, but a plumber would probably object to climbing a knotted rope to reach his work as this Frenchman is with straps*



*Anti-aircraft guns need not always have an elaborate mounting. This British machine gunner has improvised a support that gives him practically unlimited range*



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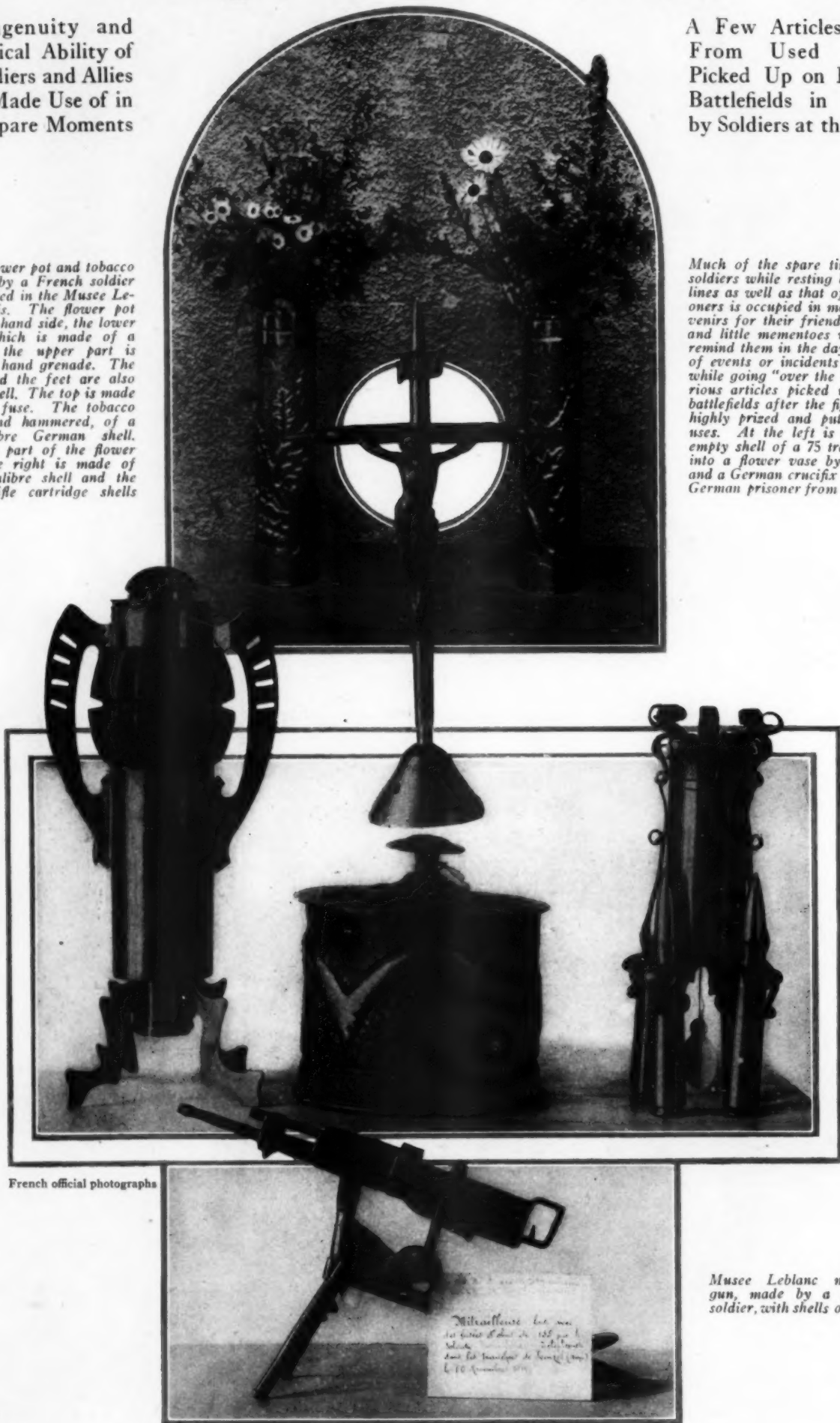
## Shelling Their Friends at Home

The Ingenuity and Mechanical Ability of Our Soldiers and Allies Being Made Use of in Their Spare Moments

A Few Articles Made From Used Shells Picked Up on Famous Battlefields in France by Soldiers at the Front

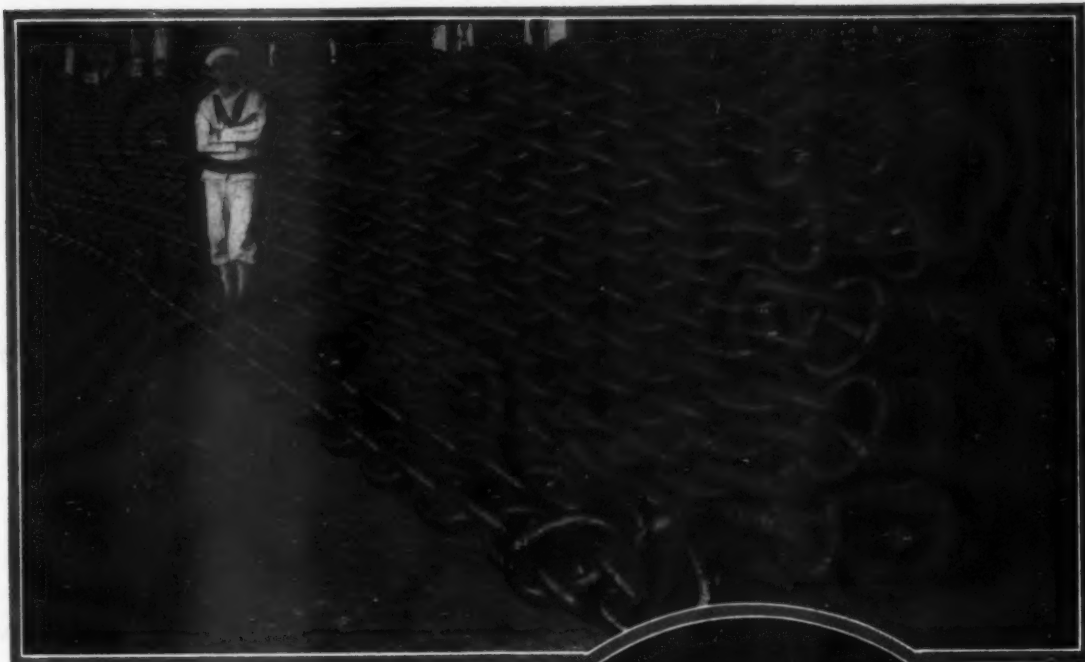
*Below: Flower pot and tobacco box made by a French soldier and exhibited in the Musée Leblanc, Paris. The flower pot on the left-hand side, the lower part of which is made of a shell and the upper part is made of a hand grenade. The handles and the feet are also made of shell. The top is made of a time fuse. The tobacco box is hand hammered, of a large calibre German shell. The upper part of the flower pot on the right is made of a small calibre shell and the feet of rifle cartridge shells*

*Much of the spare time of the soldiers while resting behind the lines as well as that of the prisoners is occupied in making souvenirs for their friends at home and little mementoes which will remind them in the days to come of events or incidents occurring while going "over the top." Various articles picked up on the battlefields after the fighting are highly prized and put to many uses. At the left is shown an empty shell of a 75 transformed into a flower vase by a soldier and a German crucifix made by a German prisoner from rifle shells*



French official photographs

Musee Leblanc machine gun, made by a French soldier, with shells of a 155



*Completed stud-link anchor chain in warehouse ready to be put aboard a battleship*

## Bottom at ? Fathoms!

### Forging the Anchor Chains for Our Largest Battleships

By F. A. Collins

© Photographs by Brown & Dawson



*After having one end bent and both ends beveled the links are heated in an oil furnace before being put through the bending machine*



*The first steps in making a chain are to forge a bend into one end of the bar to fit into the bending machine and scarph or bevel the ends for the welding*

**T**HAT a chain is only as strong as its weakest link is, of course, proverbial. In constructing the great anchor chains for our battleships every detail of the work must be watched with anxious care. No chains ever forged in America have been submitted to such enormous strains as these. The weight of the great ships, measured by tens of thousands of tons, when swung by the tides, fields of floating ice, or the force of the wind, is increased indefinitely. The lives of thousands of men, the ship itself, perhaps the issue of a battle may depend upon the strength of such

a chain and therefore upon each and every link.

A modern anchor chain often measures several hundred feet in length. The links are a foot or perhaps a foot and a half in length, so that the work of construction becomes very complicated. Such chains are forged in the Government chain shops where every detail of the work may be carefully safeguarded. Every link must pass the most exacting tests before being installed aboard a battleship. Link by link the great chain must be patiently built up.

The iron used for the chain comes in the form of long bars. The diameter of the bars

is determined only after accurate calculations of its tensile strength and the strain to which it may be subjected. The bars are first cut in uniform lengths depending upon the size of the link. One end of the bar is then heated until it is more or less pliable, when it is slightly bent over. The enormous force necessary to bend the heavy bar is supplied by a powerful machine operated by hydraulic power. When both ends of the bar have been turned it is placed under a hammer which swedges out the curved ends to a point. To keep the link from slipping it is placed in a die cut in a place block. All this is the work of a few well directed blows of the steam hammer.

The link is now ready for the bending machine which is to press it into shape. The bar is heated and placed upon an ingenious device that twists it into shape. The tons of pressure required are exerted by a hydraulic device, and the bar takes the form of the link in a few seconds. A crew of three men is required for the work. Two men lift the bar and hold it in position while a third operates the hydraulic mechanism. It is, however, important that the work be done as quickly as possible before the metal cools and becomes rigid.

It is necessary to heat the links several times during the process of bending and welding. The old forms of forges would probably be found much too slow and cumbersome for the work, so oil furnaces are used. Twenty or thirty of these giant links are placed

in a furnace at one time and removed as quickly as they come to the proper heat. The workmen are obliged to use tongs 3 or 4 feet in length in placing the links in the furnace and removing them, for the heat is intense. The use of the oil furnace saves an immense amount of time in chain forging.

Now that the link has been scarfed and bent it is ready for welding. The two flattened ends have been bent over until they overlap but without joining. Again the link is placed in the oil furnace and heated to the proper temperature, when it is placed beneath the hammers of the welding forge. Two husky workmen grasp the link with long tongs and swing it quickly to the welding machine while a third works the levers controlling the hammer. The end of the chain to which the new link is to be attached hangs just above the hammer. The heated ends are slipped through the last link of the finished chain, placed under the hammer and a few strokes welds the two ends together in a complete link. By so slow and painstaking a process is the great chain lengthened out link by link.

After the welding the link is once more reheated in an oil blast furnace. This is a very delicate operation since it is an easy matter to carry the heating too far and a few seconds' miscalculation may burn the iron. The link has already been fastened to the chain, and if it is burned it is necessary to cut it away and replace it with a new link. A special form of oil blast furnace is used for this stage of the work. The end of the massive chain, which is coiled up near by, is carried over and suspended by a pulley directly above the furnace, where it is lowered into place. So intense is the heat that the workmen use plyers and welding devices mounted at the end of arms 4 feet or more in length. Even these are handled with thick gloves. The accompanying illustrations of the final welding process show at what a respectful distance the workman stands from his furnace. Only workmen of long experience are entrusted with this delicate part of the work.

The link is now ready for its final shaping. The pounding it has received has forced it out of shape, and it is important that the links be uniform. It is again heated and placed in a steel die cut to the proper form. Another powerful hammer driven by hydraulic power now descends upon it and quickly forces it into the die, giving the link its true form. After a few strokes the link is taken from the die and the cross bar is inserted. The small

*Heating the link in an oil furnace after the weld has been completed*

cross bar found in these heavy chains prevents the links from becoming tangled up and relieves the strain. The cross bar is heated and set in place, when a single blow with the steam hammer makes it firm. It is unnecessary to weld this piece into position as carefully as the ends of the bar are joined in forming the link itself.

The link is finished by hand. Once more, and for the last time, it is softened by heat. The finishing consists in cutting away all the rough edges of the link and the slight rough projection at the ends. A smoother or rounded

*The forge shop. Here the links are welded, one by one, into the finished chain. Steam hammers make possible the welding of the heaviest links*

*The hydraulic bending machine makes easy work of forming the links for the heaviest chains*

die is then held by hand over the rough parts of the link and a few smart blows with a hand hammer quickly smooths out all inequalities. This is the only part of the hammering which is now done by hand. Formerly all the hammering and welding was hand work which rendered the process much more laborious. The great sledge hammer blows of the steam hammer not only do the work much more quickly but the links thus formed are stronger than those forged by hand power alone. With the assistance of the steam hammer there is practically no limit to the size of a chain which may be forged.

The chain illustrated herewith is the heaviest form used in the United States Navy, and is usually attached to the largest anchors. The links are made from bars of iron measuring  $3\frac{1}{4}$  inches in diameter. Each link when complete weighs 112 pounds. To handle these links a gang of four skilled workmen are required, a chainmaker, a hammer man, a tongs man and a hoist man. The work of each man is indicated by his name, and each becomes something of a specialist in his line before he is entrusted with a great chain.

# Safeguarding Life at Sea

Some of the Safety Devices That Are Found in the Modern Steamship

**G**UARDING the lives of those entrusted to their care is the first thought in the mind of every captain when the safety of his ship is threatened. He values his ship and her cargo, yet they count for almost nothing when compared to the lives of the passengers.

The designers and owners of ocean-going passenger vessels have from time to time added various safety devices to their ships until in the great trans-Atlantic liners of today these safety devices are no small part of the vessel's equipment. Of all precautions, the water-tight bulkhead stands at the head of the list.

Now, it would cause considerable inconvenience aboard a ship if it were impossible to pass from one part to another without coming on deck, so doorways that can be closed water-tight are built into the bulkheads. At first these doors were closed by members of the crew, but now the entire operation is controlled from the bridge. At the first indication of danger a warning bell over each door is rung for a few seconds, after which the door is closed. These mechanically operated doors will close even if entirely submerged, a great improvement over the older hand-operated type.

Another part of the equipment that has recently received considerable attention are the life boats.

The smaller steamers were able to carry a sufficient number of life boats at the davits ready for use, but as the vessels increased in size the number of persons aboard was more than could be accommodated in the boats at the davits so other boats were carried in chocks ready to be picked up on the lowering tackle.

On the largest steamers they use folding life boats that are carried nested on the deck somewhat after the fashion of the dories on a Down East fishing schooner. The bottom of these boats is built of wood in the usual manner. The sides are of heavy water-proof canvas that is stretched tight, when in use, between the wooden bottom and gunwale, the two being held apart by folding struts similar to those often used in automobile tops.

Another improvement of recent times is the life boat powered with a gasoline motor of sufficient size to take the boats in tow and thus keep the little fleet together. The Coast Guard long ago demonstrated that a motor

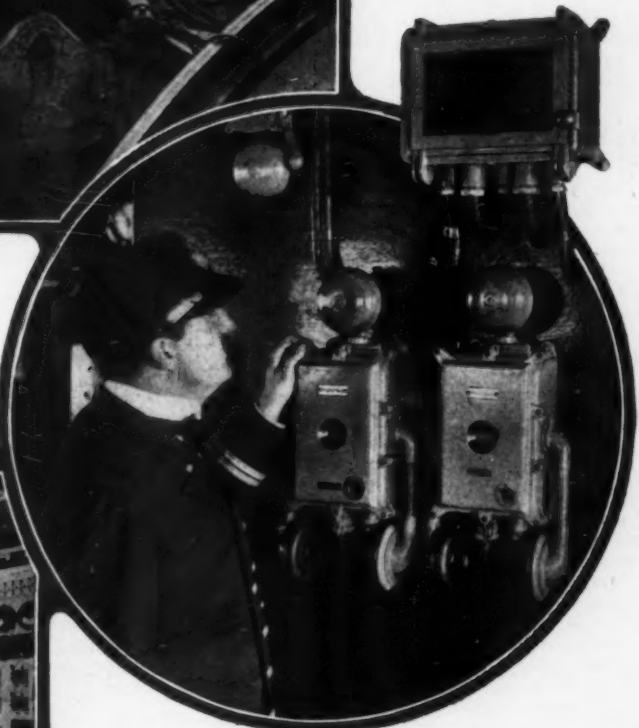


*The collapsible life boats are nested in chocks on the upper deck and are lowered into the water by means of electric winches and the usual cargo booms*

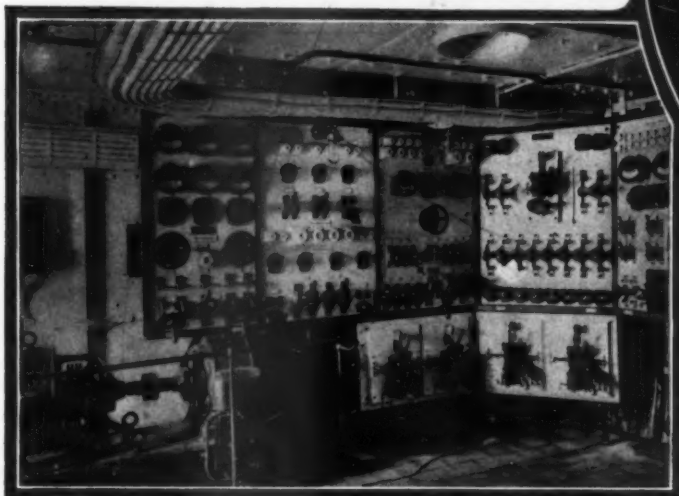
life boat was far more useful than those propelled by oars, and every bit as seaworthy. Several power life boats carried on a large steamer would in case of accident be of great service.

On the great ships of the present day electricity enters into the handling of the ship and its auxiliaries to such an extent that it is no longer safe to depend entirely on the main generators deep down in the engine-room. Should the engine-room or boiler room become flooded a big ship would be practically helpless were it not for the emergency power plant. This generally consists of a gasoline engine and generator installed on one of the upper decks.

The emergency switchboard is a rather large and complicated affair. It includes switches for controlling all the essential electrical devices aboard the ship. Should the vessel be damaged and in a sinking condition it is this power plant that must supply the electricity for the wireless, for emergency lights throughout the ship, for oper-



*Should the look-out at the bow or in the crow's-nest see danger ahead he has but to press a button. The words "DANGER AHEAD" immediately appear in the indicator on the bridge and warns the officers*



*An emergency power plant controlled from this switchboard can furnish sufficient power for the emergency lamps, wireless, and motors used in lowering the life boats*

ating the winches that lower the life boats into the water, and keep the signaling and telephone systems in operation.

On the smaller steamers the telephone and signal systems between the bridge and engine-room are of as much importance as on the biggest ocean grayhounds. Aboard the latter, however, it would be impossible to give orders from the bridge to the distant parts of the ship were it not for the telephone system. On some of the largest steamers the bridge is upwards of 500 feet from the end of the hull.

(Continued on page 102)

# Mechanical Picks of the Coal Mines

**N**OWHERE is labor saving machinery more welcome than in the coal mine.

The work in the low galleries, far from light or even air, is probably the most arduous in the world. Much of it must be done while the workman bends nearly double beneath the low roofs or in cramped positions.

It has been the dream of mine workers for centuries to replace the primitive pickaxe with some automatic device. As early as 1761 a so-called pick machine was invented in England, but the idea was primitive. It was proposed to swing a pick by means of a steam engine, which would deliver a blow equal to

## Some of the Labor-Saving Machinery Used in Mining

the passageways for any distance, and there is no problem of ventilation. A single workman equipped with one of these pneumatic drills does the work of a dozen or more of men in the old days.

The type of machine illustrated is known as an auger rotator. It is a one-man drill. The drills are used for removing rock and boring the face for blasting. Utilizing the holes bored in this way it forces wedges into

the apertures until the coal is split and comes down. The method is, of course, slower than the familiar blasting method, but it is less dangerous and does away with the poisonous fumes following a blast.

The most ingenious and efficient of the coal mining machines is doubtless the "ironclad" used for cutting the coal. More than fifty per cent. of all the coal mined in America last year was first undercut by this method. There are several types of cutters used in Europe and America. The construction is comparatively simple. They consist of a motor driven by compressed air which operates a cutting device.

The cutting is done by a flat chain to which are attached a series of chisel points. The chain passes around a movable device which may be swung from side to side, making it possible to cut a surface within a radius of ten feet of the truck carrying the machine.

The chisel points are drawn across the face of the coal at a rate of about five feet per second. Some of these cutting devices will cut from 120 to 150 square feet in an hour. The machine may be operated by one man. The work is controlled by a pair of handles at the back of the machine. Like the drill the machine is driven by compressed air. It will be seen in the accompanying illustration that the entire machine is scarcely 2 feet in height so that it can be run into low, narrow galleries through which a man could crawl with difficulty. An air pick machine is also sometimes used for this work.



*The bottom of the seam of coal is cut away by this machine so that when the blasting charges are fired all the coal in the seam will be detached from the surrounding stone*



*In some galleries the seam of coal is undercut by means of an air-operated chisel*

that of a man's, but at a much faster rate.

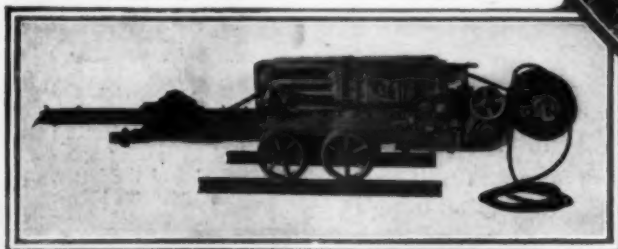
The ventilation far below the surface in these passageways must also be considered so that steam engines were not available for such work. It was only with the perfection of electrical and compressed air machinery that the coal cutting devices became possible. One of the most important of the labor-saving devices used in coal mining is the compressed air drill.

The power for operating these drills is furnished by compressed air. The pipe connected with the engines may be carried readily through

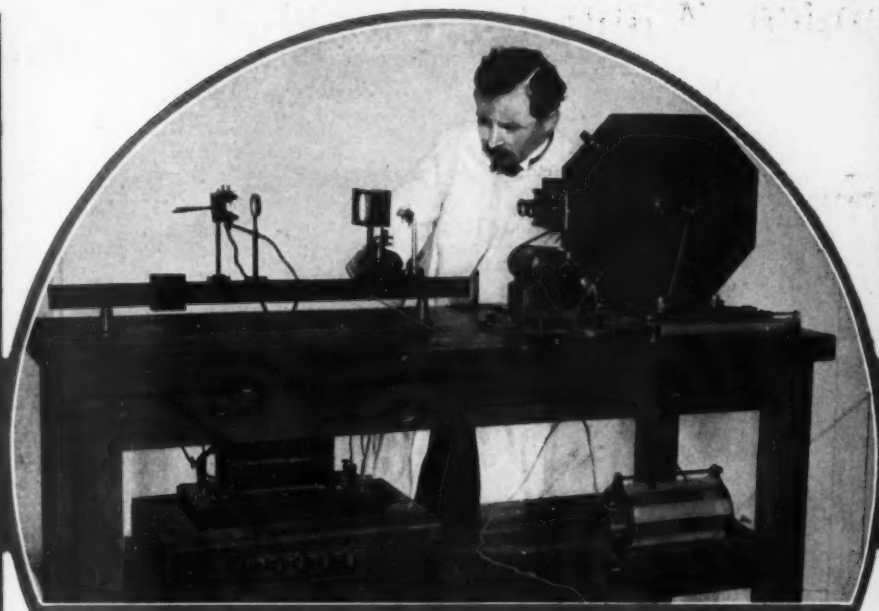


*One of the most useful tools in coal mining is the small air-operated drill that is worked by one man. This tool not only acts as a hammer but also turns the auger-like drill steel*

Photographs by Brown & Dawson



*An electrically operated under-cutting machine that can be operated in the smallest galleries. Most of the coal mined in the United States is undercut with machines of this type*



*The complete apparatus for taking micro-motion photographs of insects at the rate of 2,000 exposures per second*

## Seeing the Invisible

An Intimate Study of Insect Life

Photographs by Brown & Dawson

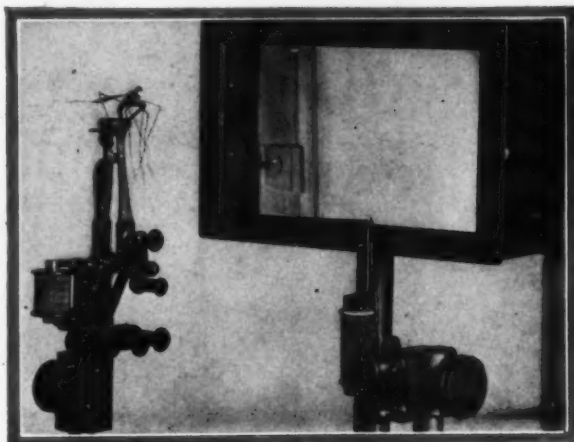
**A**N undiscovered world lies before our eyes. To our imperfect senses many minute objects, sounds and motions are completely hidden. The microscope which reveals countless mysteries can only be directed to fixed objects. It has remained for the moving pictures to reproduce the infinitesimal movements which no eye can hope to catch. The scientific research made possible by these micro-motion pictures is of the greatest importance. It is now possible, for the first time, for man to actually watch and analyze the flight of a fly, for instance, and learn its system of balancing itself.

To catch and reproduce the extremely rapid motions of insect life it is necessary to take photographs faster than 100 to the second. A scientist, M. L. Bull, has invented a camera which will take photographs at the rate of 2,000 to the second. The ordinary moving picture camera works at the rate of sixteen pictures a second. The principle of the "movies" is, of course, familiar. Each picture on the film reproduces only a fraction of the action, while the interval between the exposures is skipped. When a camera takes pictures only at the rate of sixteen to the second a

considerable portion of the action is lost and remains a mystery. In photographing or "filming" a play, however animated, this loss means nothing, but in scientific research the picture is incomplete. The exceedingly alert eye of the new camera, which takes pictures at the rate of 2,000 per second, misses very little, and hence its scientific value.

The camera is enclosed in an octagonal box from which two lenses protrude. The exposure is not made with a shutter, as in ordinary cameras, but by an electric spark whose light is focussed, so to speak, on the object. The film comes to rest for a minute fraction of a second, when the picture is taken. The exposures are controlled by a thick disk around which are placed fifty-four strips of copper insulated from each other. Two metallic brushes rest upon these, and when in motion each strip, in passing under the brushes, closes the circuit. This makes an electric spark which photographs the object on the film. By increasing the speed at which this disk revolves the rate may be increased up to 2,000 exposures per second. With every exposure two separate pictures are taken

*(Continued on page 102)*

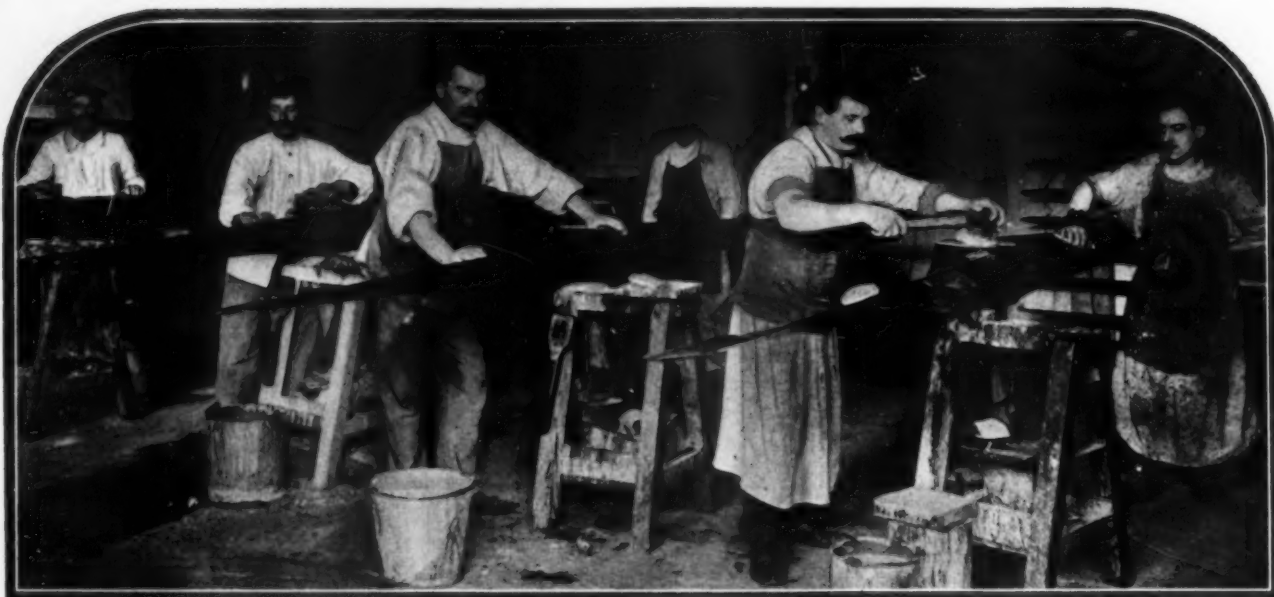


*Strip of film showing a fly taking wing from the releasing device*

*Insect held in electrically released pincers ready for his photograph*

# Wooden Wings for the Modern Mercury

The Various Processes Employed by the French in the Manufacture of Propellers for Their Airplanes



© Photographs by Kadel & Herbert



The final step in the manufacture of airplane propellers is the varnishing. They are given several coats of water-proof varnish and highly polished

**F**EW problems in mechanics are at once so complex and delicate as those encountered in building airplane propellers. These blades must be able to withstand enormous pressure, and prove absolutely dependable. An undiscovered flaw or weakness of any kind might mean a fatal accident. The curves of the blades again must be fashioned so accurately that every pound of energy exerted by the engines may be transformed into pushing or pulling force.

The designing of such a propeller involves much intricate mathematics. The blades of an electric fan are arranged to detach a cylinder of air from the atmosphere and hurl it forward. An airplane propeller is constructed on different lines to accomplish the same result except that they exert a much greater thrust or propelling power and move the entire machine. Since the airplane may weigh several tons and be driven at 100 m.p.h. or faster, much depends upon the accuracy of these curves. If the pitch of the propeller be too flat it will not take hold of the air, while if the angle is too high it will simply bore holes in the atmosphere, creating a partial vacuum which serves no useful purpose.

As a result of long experiment the makers of propellers in all countries are pretty well agreed as to the best material and methods for the work. No better material has been discovered than wood. Propellers have been made of various kinds of metal and of compositions but without success. It is not a question of having weight, but the metal will not stand the strain. The intense vibration con-

The propellers are dressed down to their final shape by means of a machine that operates on the principle of the ordinary planer found in every sawmill

After the strips of wood forming the blades are glued together they are worked to the approximate shape of the finished propeller by means of a band saw. From here they go to the vertical shaper shown in the illustration above



tinued for many hours causes the metal to crystallize and develop unexpected weakness. At a critical moment such a propeller may crack, and the machine and the life of its crew is endangered. Wood resists the countless blows and its elasticity is a valuable factor.

The best wood for the purpose is found to be walnut, beech, elm, or spruce. The United States is fortunate in having large supplies of these woods, especially of spruce in our western forests. The workers first choose pieces of wood free from any flaws. They

out the propeller will have exactly equal density. A special glue is used for the purpose. The pile of strips, arranged fanwise, is then placed under high pressure to force out any air or moisture from between the boards, when it is allowed to dry. The presses used for the purpose hold four propellers at once.

At the end of twelve hours these glued blocks are found ready for working. An experienced workman first removes the unnecessary parts, using a band saw for the work. After the propeller has had its initial dressing and is

pared down to something like its ultimate form, it is bored for the shaft. A special machine is employed, for the work must be done with accuracy. The holes must be at exact right angles to the surface of the hub, and a very slight variation would mean inefficiency of driving power and excessive vibration. In addition to the central core eight holes are drilled to be used in fastening it to the nose of the motor.

Little by little the wood is now pared away until the great blade assumes its final form.



must have absolutely straight grains. It is found that the wood at the bottom of a tree is of heavier and closer grain than that at the top, and to equalize the density of the wood the propeller is built up of a series of layers, usually seven to a blade. The propellers made in this way are much stronger than those carved from a single block.

After the strips are prepared they are glued together with the greatest care. They are not placed one directly on top of the other, but in the form of a series of steps, the width of which is the result of mathematical calculation. By this arrangement the wood through-

*The thin, sharp edges of the propellers are protected by means of a metal covering securely fastened and shaped to the blade in much the same manner as the bow of some motor boats are protected*

This work may be done by hand or with an ingenious cutting device operated electrically. These machines save much unnecessary labor and are mathematically accurate. A force equal to about 3 h.p. is employed to operate the cutting knives, which are held in contact with the work. Two, and in some cases three blades are cut at the same time by a single machine. Since the knives work at the same angle the blades are made absolutely symmetrical. Any angle may be obtained by adjusting the knives.

After receiving this shaping the blades are taken in hand by an expert who goes over them, carefully removing the slight ridges or projections left by the tools. The angles are verified, and the blade reduced to exactly the same length, breadth, and thickness. Their contour must absolutely conform to that of the original model. Delicate instruments are employed which measure every dimension to a very trifling fraction of an inch.

As a final test the propeller is fitted with a shaft, mounted on an upright and tested at every angle. The balance is very delicate and its equilibrium must be proved absolutely. If it fails to balance at any angle a skillful workman goes over the blades once more and scrapes away the wood until a perfect balance is obtained. Although the measurements may be found accurate some parts of the wood may have a greater density than others, thus destroying its balance. The propellers used for hydroairplanes or those which rise from the water are protected by a metal edge near the ends which may come in contact with the land or water. The sharp edge of a wooden blade would probably be damaged by the impact.

Once more the blades are gone over with emery paper until their surfaces are perfectly smooth, then they are treated with a special varnish. The slightest roughness of the blades will cause more or less friction in moving rapidly through the air, and therefore offer resistance which eats up the energy of the motor. The surfaces must be water-proof. The blades must, of course, be exposed in all kinds of weather and at all temperatures. They may often pass from the intense heat of midsummer to the cold of high altitudes, when they must not change their form in the slightest degree. One trouble in the past was that in a warm, dry atmosphere the blades came apart, but this has been overcome.

*The finished blades are mounted on a frame and balanced by scraping away the wood on the heavier parts. This illustration gives an idea of the size of some of these aerial propellers*





*After the frame has been set up the inside sheathing is fastened in place. This sheathing at the bottom, called foot-waling, is much heavier than the outside planking but is not caulked*



*The caulking of a wooden ship is one process that so far is successfully accomplished only by hand work. It is a job requiring considerable skill and experience on the part of the worker*

*In no country is there to be found such material for masts and spars as can*

*be cut in the forests of the Pacific Coast. Timbers of any size can be obtained*

## American-Built

We Once More Resume

AMERICA'S skill in ship building is historic. More than a century ago the Yankee ship-builders constructed a fleet which encircled the world, and held all records for speed between ports. The genius which created the famous clipper ships has only lain dormant, waiting for the call to bring it into action. Although Europe has built larger and faster ships than America for a generation or more, it has never surpassed the workmanship and grace of the old wooden clipper ships.

When the demand for ships and then more ships came, it found the United States in a measure prepared to build them. It was feared by some that workmen could not be found with the necessary skill and experience for such construction. But hundreds of shipyards, capable of turning out wooden vessels sprang up almost over night. On every coast and on the banks of every navigable river ships are now rapidly taking shape. The forests may be depended upon for a practically unlimited supply of the finest material in the world for the purpose, and American energy and ingenuity do the rest.

The output of these ship yards is already being felt in turning the balance of ship construction against the destruction of the U-boats. If a yard is not prepared to build large craft, it turns its attention to smaller boats, and since all kinds of boats are urgently needed, down to the little motor craft which chase the U-boats or patrol our shores, no energy is wasted. The old ship building yards of New England which turned out the famous clipper ships or whalers are once more scenes of activity. No elaborate plant is necessary for such



## Wooden Ships

An Art Thought Dead

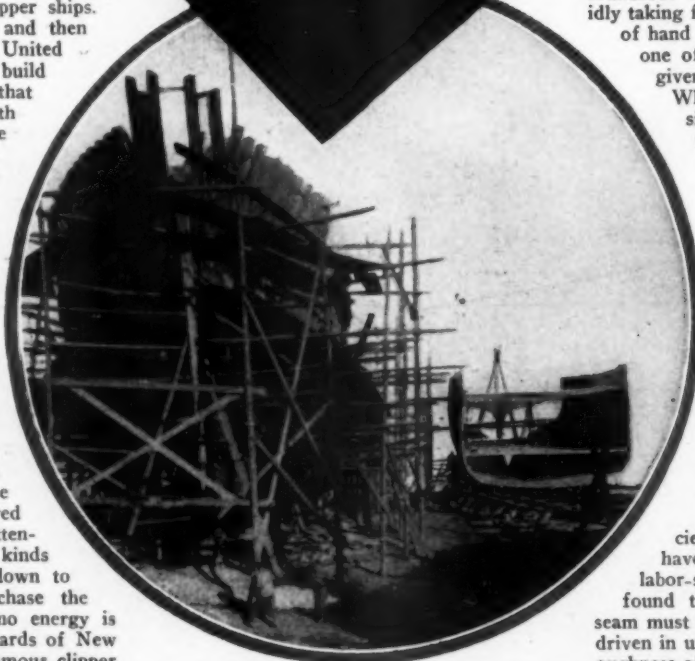
construction other than those which can be set up in a few days or weeks.

Great orders have been placed in the lumber yards for ship timber to be turned out by modern labor-saving machinery. From the mills come millions of feet of ship timbers which correspond to the parts of steel ships which American ingenuity is assembling in the great Emergency Fleet Corporation yards. Hundreds of craft, large and small, are rapidly taking form, however, merely as the result of hand labor. An interesting glimpse into one of the New England ship yards is given in an accompanying illustration.

While the frames of one ship of considerable tonnage has risen to the ultimate level of its deck another hull is being constructed on the ways beside it.

The work is being pushed with all possible speed. As many men as can be crowded onto the hulls are kept at work. The close-up of a group of workers on a wooden ship at their work, gives some idea of this activity. The men are fastening together the ribs and heavy timbers of the inner sheathing or foot-waling. The parts are first clamped firmly together, the holes drilled and the long iron drift bolts driven into place.

The caulking of a ship is an ancient art in which American workmen have excelled for generations. No labor-saving machinery has yet been found to do the work efficiently. Each seam must be filled with oakum and skillfully driven in until tight. Upon the skill and thoroughness of these workmen depends the safety of the ship, and the lives of her crew. If the fastenings start the ship is lost.



*Wooden ships such as these are rapidly taking shape on the Atlantic, Gulf, and Pacific coasts*

# Hearing Sunshine and Seeing the Wind Blow

SOMEONE has said that "wonders never cease," and when we hear of the operations of the modern weather man we are inclined to agree with this statement. The latest "stunt" of the weather man is to hear the sun shine and see the wind blow. The

current to span. When the sun comes out, however, the mercury in the thermometer rises and bridges the space between the two points, thereby completing the electric circuit. So long as the sun continues to shine the electric circuit remains intact, but the moment it goes behind the clouds the mercury falls and the circuit

ment below. This instrument, the triple-self-register, is operated by a very delicate and exceedingly accurate clockwork. As the minute hand of the clock reaches a given point at each of its revolutions an electric contact is completed, this operating one of the arms, containing a pen, with several of which the triple-self-register is equipped. It is this clicking sound, caused by the contact being completed by the clock, that makes it possible for the shining of the sun to be heard, for the clicking occurs only when the sun is shining. Each black dot upon the paper, caused by the dropping of the pen in the sunshine arm, represents one minute of sunshine.

The anemometer is the instrument shown in Fig. 2. This consists of four aluminum cups, located at the ends of as many slender arms, this entire arrangement being sit-

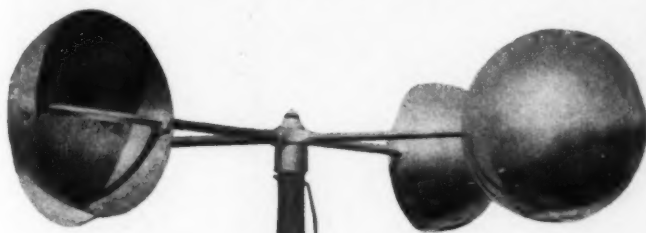


Fig. 4—The rainfall is measured by a double bucket within the metal case. When one part becomes full it automatically tips and empties, bringing the other bucket into place

Fig. 2—The velocity of the wind is measured by the speed at which it rotates the four cups on the spider. The recording device is so arranged that when one mile of wind has passed the anemometer, it is recorded on the cylinder, and the number of dots per hour is the velocity of the wind in m. p. h.

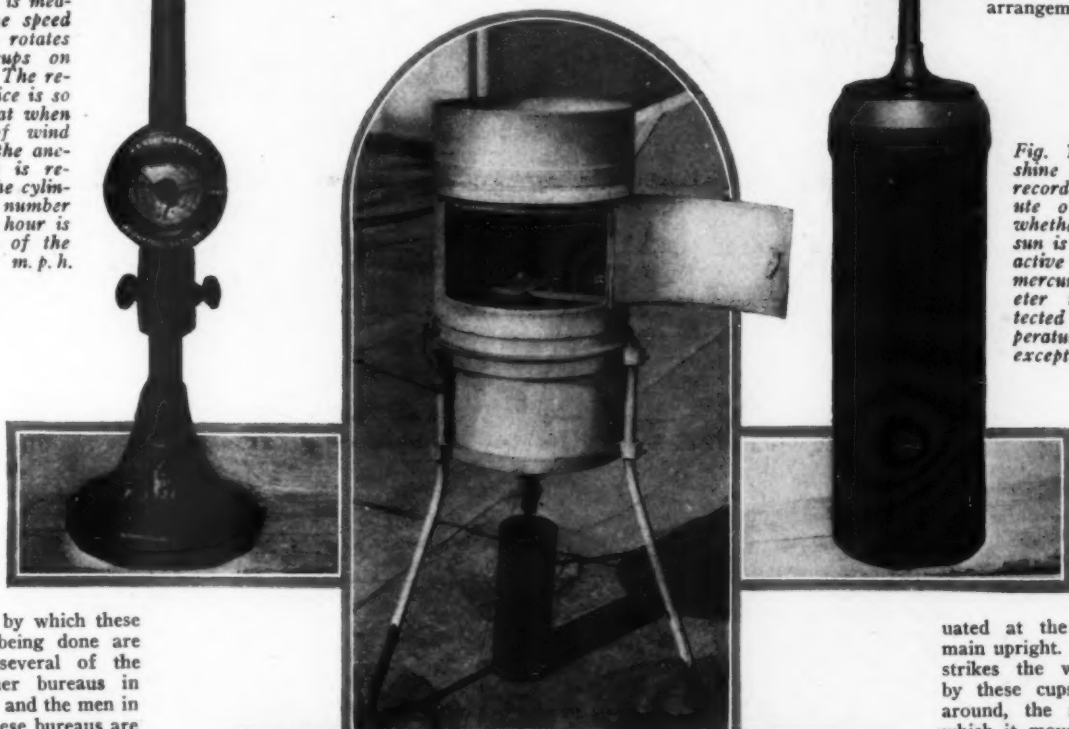


Fig. 1—The sunshine gauge which records every minute of the day whether or not the sun is shining. The active element is a mercurial thermometer that is protected from temperature changes except from the sun

instruments by which these things are being done are located at several of the large weather bureaus in this country, and the men in charge of these bureaus are the very ones who are witnessing these remarkable results.

Two of the instruments employed in this remarkable work are located upon the roofs of the buildings which house the weather bureaus, while the third is located within the main office of each bureau. The instruments located upon the roof are known as the anemometer or wind-velocity gauge and the other is the sun thermometer or sunshine gauge. The operation of both of these instruments is recorded electrically and transmitted by wire to the third instrument, known as the triple-self-register, located within the office, where a visible record of the operation of the two out-door instruments is made.

The instrument shown in Fig. 1 is the sunshine recorder or gauge. At a given point in the thermometer portion of this gauge are two contact points which, when the sun is not shining, are too far apart for the electric

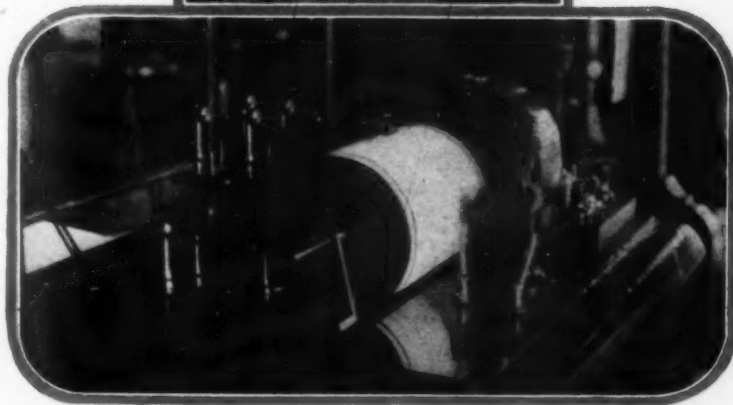
The combined daily record of sunshine, rainfall, wind velocity, and direction are made in ink on the paper covered revolving cylinder

is broken and the instrument ceases to operate.

Upon the completion of the circuit at the sunshine gauge upon the roof, the electric current passes by wire to the recording instru-

uated at the top of the main upright. As the wind strikes the wheel formed by these cups it turns it around, the rapidity with which it moves being governed by the velocity of the wind. As this wheel revolves the speed at which the wind is traveling is registered on a small dial situated a trifle below the center of the upright. While this dial is performing the recording operation, the wind velocity as recorded is being transmitted by wire to the triple-self-register in the office. Upon reaching the self-registering instrument the electric current is conveyed to the wind-velocity arm and pen by means of the closing of the second circuit within the clock. For the recording of the speed of the wind the clock has been so equipped that the electric circuit is completed once every mile of wind, rather than once a minute, as is the case with the sunshine recorder. It is by watching the pen move over the face of the paper that the blowing of the wind may be seen, and that the speed at which the wind is traveling may be ascertained.

(Continued on page 78)



## Action—Reaction

Some of the Tests to Which the French Government Put Their Aviation Recruits to Determine How They Will Act in an Emergency

**W**HAT are the psycho-physical qualifications necessary in a prospective aerial pilot? How are these to be defined and measured scientifically? This is the delicate problem set themselves by Drs. Camus and Nepper, charged with the testing and selection of candidates for the French Aviation Corps.

Drs. Camus and Nepper commence by determining at what fraction of a second after having received a sense impression the subject reacts. The practical importance of these factors in the domain of military aviation is obvious. For suppose that an aviation pilot suddenly discovers, for example, a machine gun, which has been concealed from him up to that instant by the topographical features of the ground beneath him; how much time will he consume in the execution of a maneuver for the purpose of avoiding its fire?

Drs. Camus and Nepper also determine to what extent the candidate's respiration and heart action are affected by his emotions.



*That small fraction of time required for the nerves and muscles to react to sound is measured with a d'Arsonval chronoscope*



A sort of recording stethoscope is attached to the candidate's chest. This instrument conveys the respiratory vibrations to an inked needle which records them upon a moving sheet of paper. By similar means the trembling of the hand when supported only at the wrist, are recorded. After the candidate has been hitched up to all this apparatus, as indicated in the illustration, a revolver is unexpectedly shot off close to his ear, and the effects of this treatment on his several functions under observation are read off from the graph.

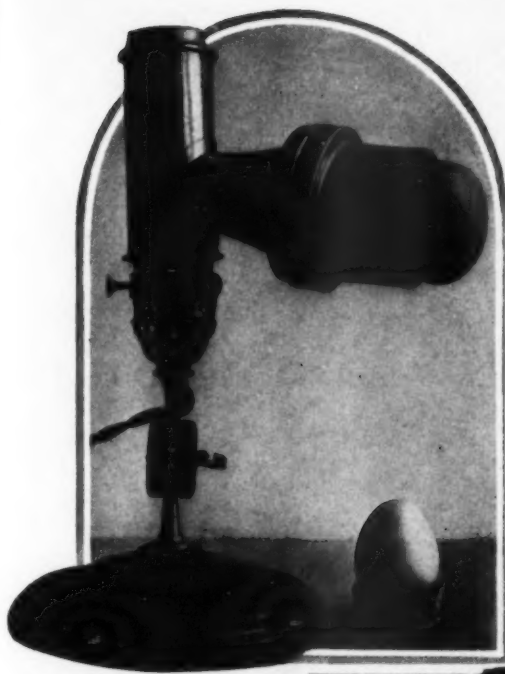
Further tests are designed to measure the degree of local fatigue. His arm and hand are so confined that only the one finger being tested can possibly do any effective work. To that finger is attached, by means of a cord running over a pulley, a scale pan with iron weights in it. A tooth gear furnished with a brake makes it possible for the candidate to raise this pan by contracting his finger, but prevents the pan from going down again when the finger is relaxed. The candidate works his finger back and forth till it is incapable of further movement, whereupon the total weight of the pan is multiplied by the distance he has lifted it to obtain an index of fatigue for the finger in question.



*The supreme test. The reaction of the emotions to an unexpected pistol shot is recorded graphically on a chronograph*

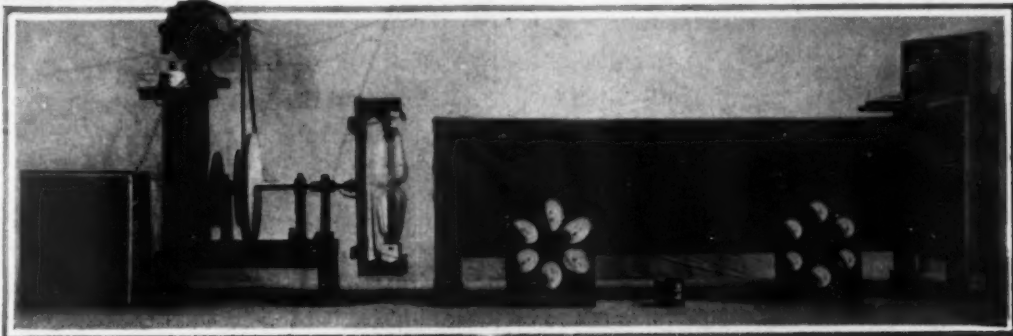
# Did You Enjoy Your Breakfast?

A New Device Which Will Aid in  
Determining the Condition of an Egg



Photographs of the internal condition of individual eggs are obtained by the use of this electric lamp together with an ordinary camera

The entire apparatus employed by M. Le Roy is very simple. Six eggs are inserted in the holders and placed in the end of the camera box. To obtain an even distribution of light the two high-powered electric lamps are rotated by the motor while the photograph is being taken



The apparatus devised by M. Le Roy not only produces a photograph of the eggs which clearly shows the size of the air chamber but at the same time reproduces on the print the lines of a scale for measuring the telltale air space

HERETOFORE, in order to learn the state of preservation of an egg, or to distinguish a storage egg from a fresh one, the process of holding up to the light has been the only one available. In the Paris market eggs are sold, whether privately or at auction, through sworn agents holding government appointments. Then whoever the shipper or the buyer, they pass through the hands of the official inspectors whose duty it is to verify the number and the quality in each package.

These inspectors work, seated two by two, in a dark place close to a case of eggs with a lighted candle between them. In each hand the workers take two eggs, bringing them one after another between his eye and the flame. The egg appears transparent or spotted, ac-



The present method employed in candling eggs is extremely crude and unfortunately does not reveal several valid reasons for rejecting an egg

has not yet got his procedure to the place where it can be carried out rapidly enough to replace the older technique as a commercial process; but on a laboratory basis it works so admirably that there is great hope and great desirability of his ultimately being able to do this.

Like the old, the new process depends upon the air chamber in the egg; but instead of relying upon the visible variations in this chamber, M. Le Roy takes a photographic print of it. At first he had a notion that he might be able to use the X-ray; but the radiographs of eggs which he obtained have large and distorted images, difficult to measure.

Contrasted with these unsatisfactory results, M. Le Roy was able by direct photography, taking advantage of the transparency of the eggs, to secure highly characteristic data. It was only necessary to employ an intense light, a powerful lens, a highly sensitive plate, and an exposure of from one to three minutes. The

© Photographs by Kadel & Herbart



prints thus obtained, whether on large or reduced scale, gave an exact and easily interpreted representation of the eggs.

Of M. Le Roy's apparatus concerned in the direct business of photographing, we need mention only the ingenious metal plate with six oval holes, in it, so disposed that the eggs may lie with their major axes all pointed inward to a common center, and at just the right angle to get the most effective image on the plate, of the whole end containing the air-chamber. The light from powerful lamps is not reflected from the eggs, but passes through

(Continued on page 78)

## Using Gravity for Construction and Destruction

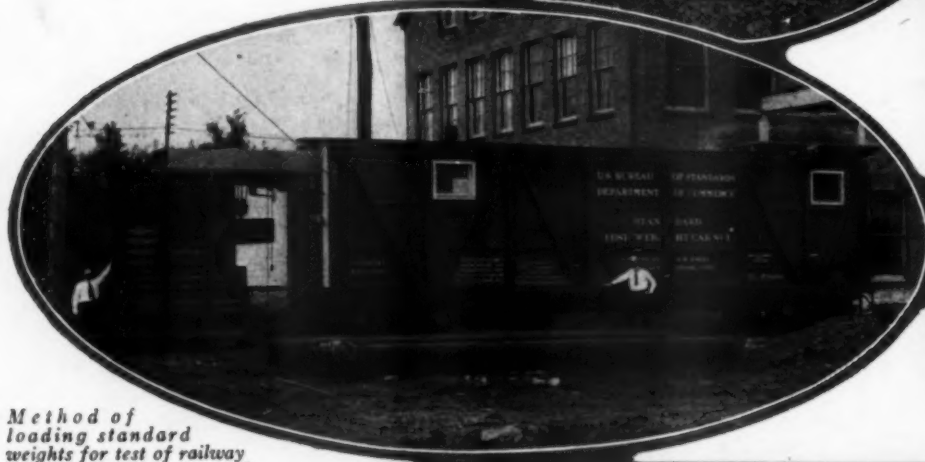
**A** CHICAGO contractor conceived the idea of using an iron ball weighing over half a ton to demolish a reinforced concrete structure which is being removed to make way for the head house of the new Chicago Union Station. The ball was dropped from a height of 40 feet, the apparatus used consisting of a stiff-leg derrick and a 40-foot boom, the whole being moved from place to place and from floor to floor on a platform with rollers.

Some idea of the force of the ball when dropped 40 feet may be gained from the fact that it crushed through reinforced concrete floors 8 inches in thickness. The eight floors of the building, and all columns and walls, were razed at the rate of a floor a week, the floors being approximately 110 x 125 feet. A force of only four men was required to operate the ball, thus resulting in a considerable saving in the amount of labor required to do the work.



An iron ball weighing over half a ton and dropped from a height of 40 feet was used with success in demolishing a concrete building in Chicago

The illustration below shows a fragment of a shell recently thrown into Paris by the Germans from their long-range gun. Up to the present time no detailed description of these guns has been obtained by the Allies but judging from recovered fragments of the shells it appears to be a 210 mm. rifle



Method of loading standard weights for test of railway track scale onto a truck

**U**NTIL recently there has been no really satisfactory way of testing the accuracy and adjusting the track scales used by the railroads throughout the country.

To do this the Bureau of Standards of the Department of Commerce have recently put into service a test-weight car embodying many improvements over former methods of doing this work. The car itself is of the standard heavy type with steel under-frame and roof with trussed steel sides to which the wood siding is fastened.

The equipment consists of a truck to carry the test weights onto the scale and an overhead crane that can be run out from one end of the car for handling the heavier weights. The weights, of which there are eight of 10,000 pounds and four of 2,500 pounds each are of cast iron, machined all over, and 10,000 pounds in fifty-pound weights. The latter are packed in three boxes equipped with handling apparatus.

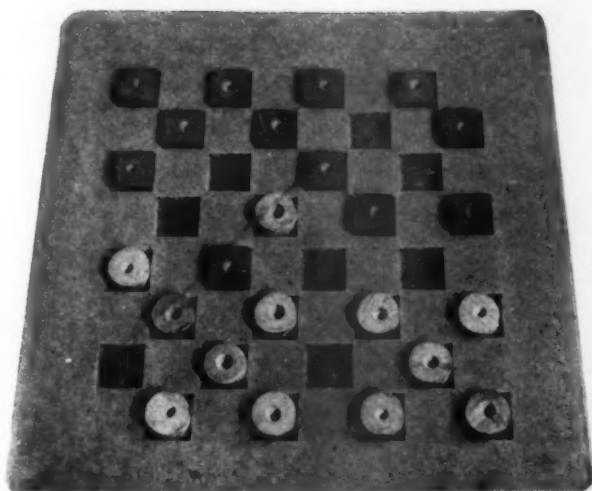


A caterpillar tractor acting as a switch engine in the shipyard of a large automobile factory. The caterpillar tractor is especially suited for service of this kind as it can run equally well across rails or on the cross ties of a railway

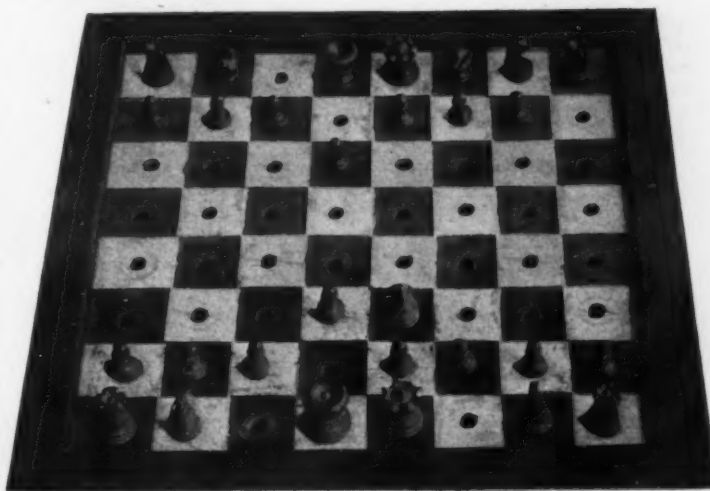
# Games for Blind Soldiers

Some of the Ways in Which Games Have Been Adapted to the Needs of Those Who Cannot See

Photographs by Brown & Dawson



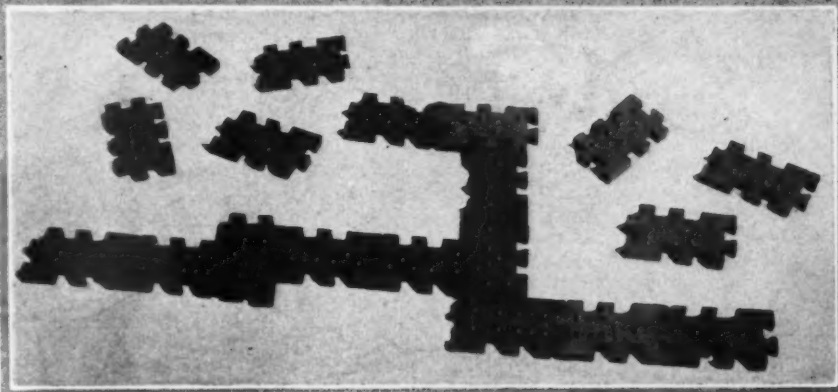
As the blind cannot distinguish colors the checkers are made round and square and one set of squares is recessed to hold the checkers in position



Each white chessman has a small point on top while the black ones are all rounded. Each has a peg to prevent it being upset when making a move

EXPERIENCE has taught those who have the care of the soldiers blinded in battle that the men are happiest and less conscious of their misfortune when they are occupied with games. The blind man does not want to be entertained with games specially invented for his use; he wants to play the same games that other people play—chess, checkers, dominoes, and cards. Impossible, one would say. How can a blind man play whist, or chess? Yet it has been made possible. Visit any of the large sanitariums where Great Britain takes care of her soldiers who have lost their sight in the war, and you will find groups here and there playing with regular cards and handling them with almost as much speed as the bridge shark who has two good eyes.

This has been made possible by a system of marking cards with embossed characters which indicate to the sensitive touch of the player the suit and number. This embossing is done in Braille characters from the blind alphabet. The impression is so slight as to hardly be noticeable to the eye, yet can be easily read by the fingers of the blind. The cards used are the familiar commercial playing cards. The embossing is quickly put on with a typewriter which embosses Braille characters. At first special cards were made which could only be used by the blind, but they were not popular; the blind man wants to be able to play with anybody. With a deck of the kind illustrated here he can have a friendly game with whoever chances to drop in. But how does the blind man know what cards are on



bottom which sets in one of these holes. This keeps the pieces in place so that they are not easily disturbed by a groping hand. The white set of chessmen each has a little point on top while the black pieces are round on top.

This makes it easy for the blind man to tell which are his pieces and which are those of his opponent. He passes his hand lightly over the board, "sees" in his mind the layout just as clearly as you see it on the board before you. There are some excellent chess players among the blind.

Checkers are played in much the same way. The black squares on the board are hollowed out. One set of checkers, the white, are round, and the black ones are square. This makes it easy to tell them apart.

The dominoes for the blind are rather ingenious. Recognizing the need of something that would not easily be displaced as the fingers of the blind passed back and forth reading the numbers on the face of the pieces, the inventor has given us a set of interlocking dominoes. A mortise joint makes them hold together no matter how much they are brushed around. The number on each piece is indicated by the raised heads of brass tacks, and easily read by the touch.

The blind man can write letters on his typewriter without any trouble. He can use the Braille typewriter if writing to another blind man, or if writing to a friend with sight he uses an ordinary standard machine and works by the touch system. But how to do sums in arithmetic, that was quite a problem till

(Continued on page 84)

To prevent displacing the dominoes they are made to interlock. The blind use the ordinary playing cards with Braille characters in the corners so they can play with their friends

the table? That is where the wonderful memory and visualizing power of the blind comes in. He remembers them as they are called out. When one faculty is taken away from man the other senses become highly developed to take its place. The sense of touch, the hearing, the memory all come forward and do their share to replace the loss of sight.

A chess game with a blind man is exactly the same as a chess game with any one else. The board has a round hole in the middle of each square and each piece has a peg on the

## Mechanics of the Month

**J.** H. MARTIN, of Springfield, Mo., appears to have solved a problem in the invention of a machine which can be operated by river current and made to produce actual power.

It consists of a wooden framework about 16 feet long by 12 feet wide, which is floated on two pontoons and is secured to the bank of the river by cables. Inside the framework are slung two sets of sprocket wheels attached to each other by chains. Attached to the chains, at equal intervals, are four big wooden paddles or vanes, 7 feet long and 2 feet wide. The sprocket shaft is geared to two 100-gallon force pumps, and with a six-mile current, these pumps will force water through a 3-inch pipe to a height of 100 feet and at the same time operate a 4 k.w. dynamo to full capacity.

It is easy enough to force a broad resisting surface along with a reasonably strong current of water. The problem comes when the paddle is lifted out of the water, at the same instant that the paddle at the other end of the framework is descending into the water. The resistance represented at one end will invariably neutralize the movement at the other end, thus causing a cessation of movement altogether.

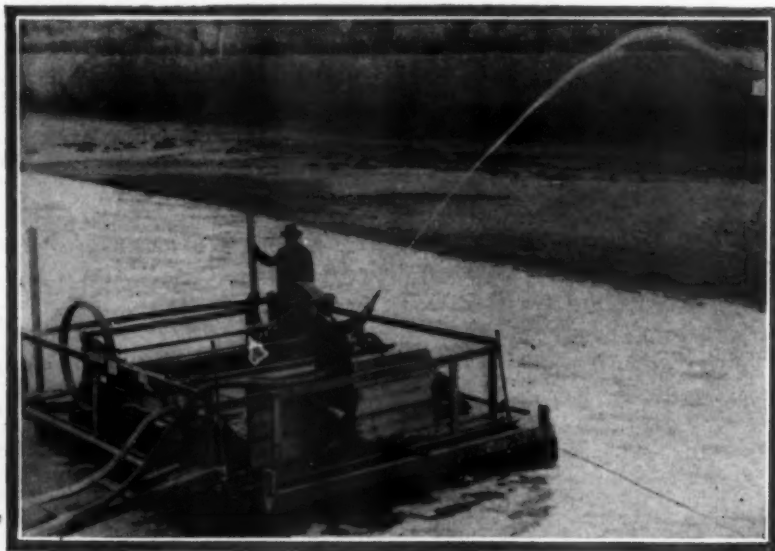
Mr. Martin rigged up some auxiliary paddles on each side of the main vanes, slung on hinges. Then by the addition of ratchet arrangements on the big vanes, he forced the latter to assume a perpendicular position while under the water, the vanes being automatically released at the instant the sprocket wheel begins to lift them out. A

French Official Photograph



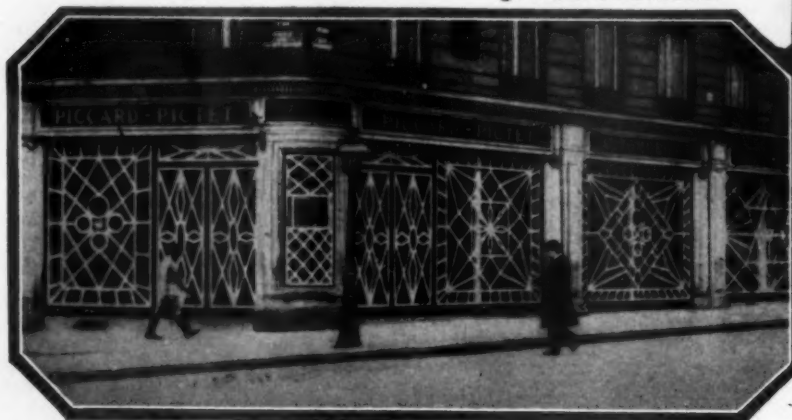
*A native moving picture show in the streets of Fez, Morocco. The machine is an extremely crude one made by the operator himself, but is not lacking in interest to the dusky audience*

Photograph by R. H. Moulton

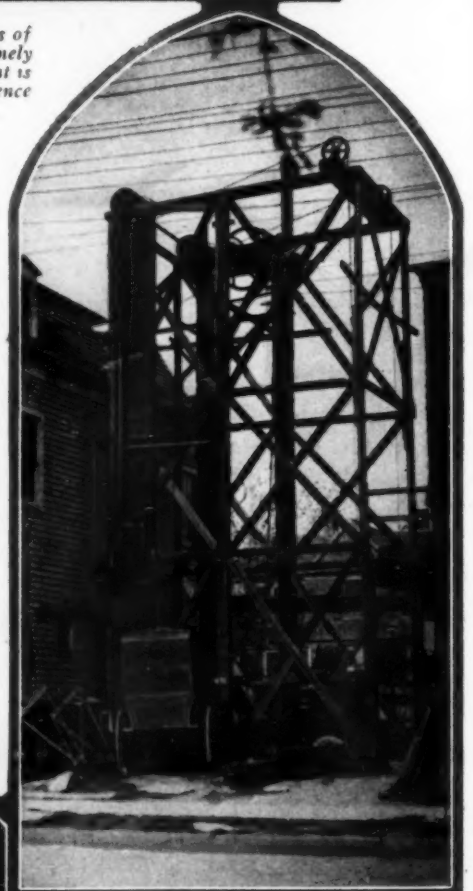


*An irrigating pump that is operated by the current of the river*

© Photograph by Kadel & Herbert



*Strips of paper pasted on show windows in Paris to lessen the danger from flying glass should a shell burst near*



© Photograph by Brown and Dawson

*The fact that his building was too small to accommodate an elevator did not deter this automobile dealer from building it outside and keeping his stock of cars on the second floor*

contrivance attached to the machine enables the operator to vary the depth at which the current will take effect, thus regulating the power. Such a device as this can be operated on any stream with an appreciable current, and the only limit to the power developed is the width and depth of the waterway. To deliver power beyond the limit of one machine it is only necessary to add another unit.

# Where France Meets Italy

There a Navy of Armed Motor Boats  
Is Always on Duty



*A warship which more resembles a barge or scow. The power plant appears to be an outboard motor of large size*

TO guard the French-Italian border no fleet of battleships, cruisers or destroyers or U-boats are necessary. All has been peaceful for ages and from present indications probably will remain so for a long time to come. But high up in the Alps on the beautiful mountainous lakes there is a fleet of armed vessels which are used to maintain order, prevent smuggling, and similar offenses. But these vessels are but motor boats, probably the only motor boat navy in the world.

The vessels of this navy are small, some even being powered with outboard gasoline motors,



others are of the open boat variety, but they are all armed and ready for business on a moment's notice.

The illustrations on this page will give one a good idea of the boats and the power plants.

These power plants are of the outboard variety but much larger and of a different type than those of American design. The cylinder is vertical and mounted at the forward end of a bracket that also carries the gasoline tank and muffler. The drive appears to be by means of bevel gears, the cylinder sets vertical which would require two sets of gears in the shaft line.

*The house at the lower right marks the French-Italian international boundary. Note the tricolor of France and the cross of Italy flying from the same flag pole*



*The naval officers and enlisted men taking supplies aboard their warship*

# Motor Boatmen Become Semaphore Experts

By Alfred F. Loomis

**B**EFORE the war, communication between motor boats was largely a matter of using the megaphone and straining the ear to catch spoken syllables above the noise of the power plant. In answering the call of the colors afloat, however, thousands of motor boatmen have placed themselves in the way of learning naval methods of communication, and there is little doubt that at the full resumption of peaceful cruising they will put their new knowledge to extensive use. When small boats are generally able to speak to one another with the hand flags and blinker light, the existing bond of fellowship between boatmen will be greatly increased, and there will be found new delights in cruising. Gossip will be exchanged between boats passing hundreds of yards outside of hailing distance, and concise information will be dispensed as to waterways and dangers to navigation, where heretofore the best that could be expected was violent and indistinguishable gesticulation with the hands.

So far as the exchange of gossip goes, the boatman who has joined the Naval Reserve Force is now having a wonderful opportunity to develop his talents. To the layman who romantically invests all things naval with grimness and mystery it may seem incredible that most of the signaling done between S.P. boats and battleships alike is gossip pure and simple. From the shore he sees the signal boys of two battle wagons semaphoring with their usual dexterity, and he imagines that the fate of nations depends upon the correct deciphering of the messages. Yet the chances are ten to one that Bill Jones of U.S.S. North Pole is asking Sam Swift of U.S.S. South Pole whether he "rates" shore liberty on the following Sunday and is being told that Sam overstayed his last liberty twenty-four minutes and is on restriction for two weeks.

You will ask why the transmission of such trifling messages should be allowed between ships of the line and you will be informed that the Secretary of the Navy himself has directed that quartermasters and signal boys be encouraged to swap private messages at all times so that they may be in trim to receive official messages with speed and accuracy. Only flagships are excluded from this general practice.

The Navy has its own slang phrase for every conceivable circumstance, and the Reservists haven't been slow in adopting this phraseology to their own use. Any interchange of unofficial

messages, whether by semaphore or blinker, is therefore universally called "a game of flats." AB calls CD, spells out PVT to show the private nature of the message, and then asks, "How about a little game of flats?" CD replies with the letter R of acknowledgment, and the gossip begins.

My own acquaintance with this phrase came about in an unpleasant manner. I hadn't been in the service long when late one night we came to anchor off a certain naval base and turned in for what sleep we could snatch between the hours of 1:30 and 5:30. The seaman on watch for the succeeding four hours had not been well drilled in the blinker code, but I made him familiar with our call letters and left instructions to be awakened if the base signalled us. Then I went below with a clear conscience.

At 3:30 of this freezing morning the deck watch tumbled down the hatch to say that the station was calling us—"frantically", I believe he put it. So I rustled into my windproofs, reached the wheel-house, and flashed out the acknowledgment. Half asleep as I was I couldn't make sense of the message which came back to me, but I replied that we were not drifting on to the flats. Then came the statement, "I meant, do you want to practise a little blinker?" And I replied, "At this hour decidedly not," along with a few well chosen words whose usage is not restricted to the naval arm of the service. Since this occurrence the seamen on our vessel have been well schooled in blinker.

The semaphore code is the quickest of all methods of visual signaling, and it is further distinguished by being the official means of communication between units of the Army and the Navy. The Army uses the wigwag (dot and dash code) extensively, and the Navy the International flag code, but when one speaks to the other it is usually by the two-flag method. Still, to watch the painstaking, laborious semaphoring of the doughboys you

would hardly guess that they are talking the same language as the signal boys of the Navy. And I don't believe the soldiers themselves know it. With them each letter is a distinct physical effort, as though the arms were being forced through an almost unyielding medium; but in the Navy the flags melt from one character to another so smoothly that the unaccustomed eye sees only a flutter of red and yellow bunting. Yet the Navy system of imparting an interrupted rotary motion to the arms instead of jabbing out each letter separately is wonderfully distinct and rapid, and when one gets the knack of it he can send and receive twenty-five words a minute with very little effort.

Abbreviation is not countenanced in official messages, but in PVT there are certain shortcuts which materially increase the speed. *The* is shortened to *t*, and *that* to *TT*, while *are* and *you* are naturally spelled phonetically. *Going* is used with great frequency, for one is always going to do or rate something and is anxious to tell some one else about—so the word is abbreviated GG.

Without abbreviation's aid, however, speeds up to thirty-five and even forty words a minute will be attained by the experts, while I should hesitate to commit myself on the rapidity of the "short-arm stuff" at its highest development. Semaphoring of this kind, done without flags at short distances, consists of forming the letters by moving the hands from the wrists only, and when seen for the first time it makes one think of a person of Hebraic persuasion talking with a deaf mute.

Between the fleets of the eastern and western coasts there is great rivalry in all kinds of signaling, and the quartermasters of different units of the same group constantly strive to prove themselves most proficient in sending and receiving. As between the regulars and the Reserves there is little if any of this rivalry, for it must be humbly admitted that the former hold the latter in good-natured contempt. It is the old story over again of the regular Army and the National Guard, with the irregulars getting along very nicely, thank you, despite the professionals' feeling of superiority. On the whole, the Reservists have done surprisingly well in all phases of the seafaring art during the short year of their service, and you will occasionally find a semaphore expert in the Reserve Force who can beat the best signal boys of the Atlantic fleet at their own game.

(Continued on page 84)



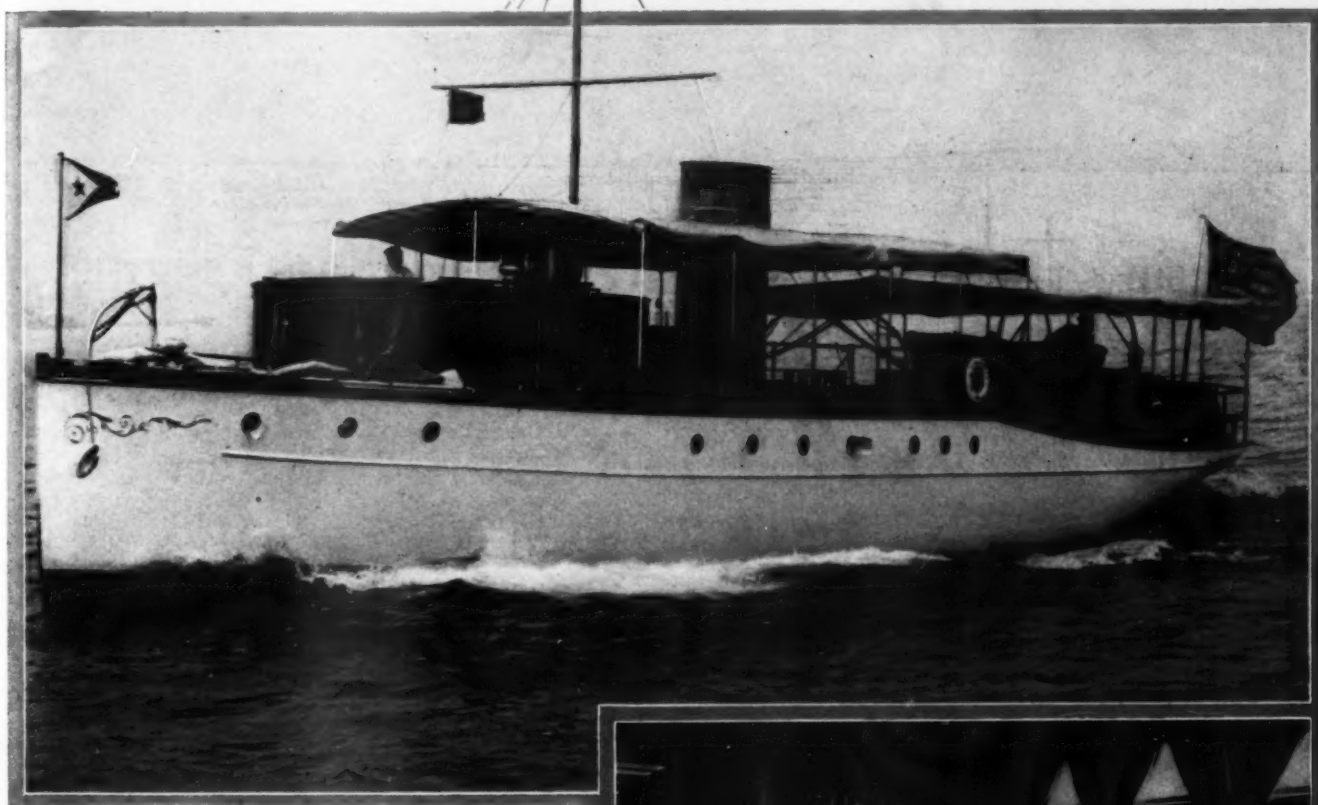
A class in semaphore signaling at the naval training station at Newport

## Siwash,

Speedway 78-Footer of a Type Emi  
for Peaceful Pursuits, but of Unusu

## a Real Cruiser

nently Suitable for Offshore Patrol Work—Built  
ally Substantial Construction and Ample Power



*Siwash was constructed last summer for Charles A. Schieren, of New York. She has a 16-mile speed*

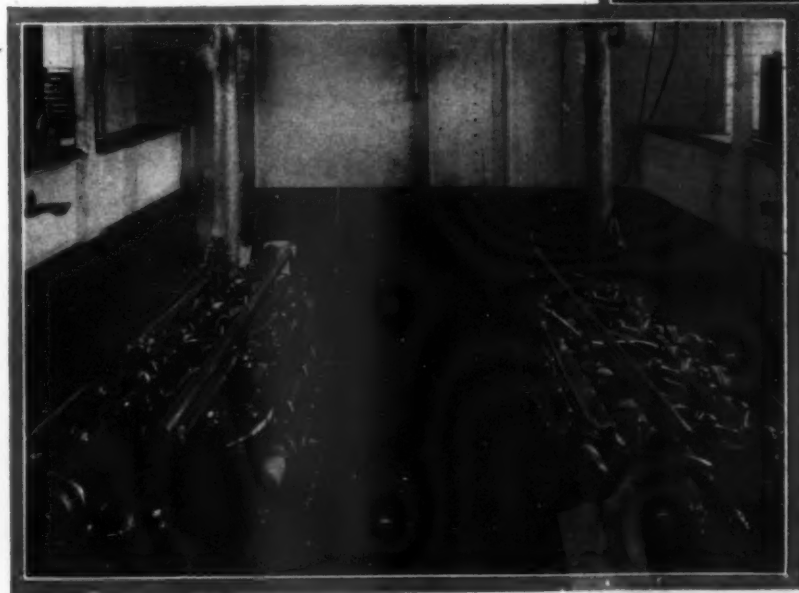
**SIWASH**, the twin-screw Speedway motor yacht completed last summer for Charles A. Schieren, of New York City, represents one of the very few real cruisers of moderate dimensions built since the trend toward scout cruisers became marked, yet, in spite of her yachtness, Siwash could be converted satisfactorily to perform the duties of a patrol boat or any other service in which a craft of her length could be used.

The builders, the Gas Engine & Power Co. and Charles

*Photographs by Rosenfeld*



*The after compartment is used as a social hall. It is furnished with book shelves, lockers and two transoms*



*The motive power is furnished by two six-cylinder 120 h.p. Speedways. Included in the engine-room equipment are an electric light plant and the usual auxiliaries*

L. Seabury & Co., Cons., of Morris Heights, N. Y., constructed this boat on similar lines to many of their previous craft. Strength of construction and a big, deep-bodied hull with a powerful engine installation make for a seaworthiness which can hardly be obtained in the lightly constructed models.

Siwash is 78 feet long, 14 feet 9 inches beam, and 4 feet 3 inches draft. This size permits of the popular deck dining saloon, which is sunk in the deck.

The owner's stateroom is abaft the motor compartment. There is a wide fixed berth built in on the starboard side and an extension seat to port. The bathroom next aft on the port side has direct communication with the owner's stateroom and the central passageway. A comfortable single stateroom is provided opposite the bathroom. The aftermost compartment is used as a social hall.

Two six-cylinder 120 h.p. medium-duty Speedways furnish the motive power.



*Although the large steam yacht can navigate hundreds of miles of the deep waterways between the Thousand Islands of the St. Lawrence, the shallow draft motor boat opens new vistas and scenes of which the summer resident never tires*

## Housing the Motor Boat Where It Is an Essential

On the St. Lawrence River Where There Are Many Homes Located on Islands and No Other Mode of Transportation Is Possible

By Harold Whiting Slauson

ON some of our most prosperous farms of the Middle West the barns and other agricultural buildings are more pretentious, more luxurious, and better equipped than the dwelling itself.

A somewhat similar condition prevails in the summer resort section of the St. Lawrence River where every phase of the daily life of the residents is dependent on the motor boat. There the housing of the craft is a primary consideration, and although the owner and his family must needs be content with portable bungalows or canvas tents, the faithful motor boat on which their social intercourse, and even their daily mail and food supplies, are dependent will be furnished with a comfortable and water-proof shelter suitable for both summer and winter housing.

Fortunately, the portion of the St. Lawrence River known as the Thousand Islands is not affected by



*Plenty of docking facilities for the motor boats of guests is an important part of the design of many boat-houses. In this boat-house, belonging to J. N. Oliphant, the parking space is especially commodious*

the tide, and the possible variation in the height of water from one year's end to another is scarcely more than one-and-a-half or two feet, and even between the periodic high and low years when these conditions are exaggerated in both directions the difference will not exceed three feet. This consistency of water level enables substantial boat houses to be built with permanent slips, solid floors, and heavy piers, and as there is but little current, the ravages of the ice when it breaks in the Spring represent the principal forces of nature which must be guarded against.

This permanency of floors and foundation means that a greater investment can more safely be placed in the construction of the motor boat-house on the St. Lawrence than on any of our waterways more seriously affected by tides, freshets, and other destructive forces of nature. It is, therefore, but natural that many boat-houses should combine



*Here the famous St. Lawrence skiff has not been forgotten, and this boat-house, with commodious servants' quarters above, is devoted solely to the accommodation of this famous craft. Other boat-houses on this island, belonging to James H. Dawes, have accommodations for steam yachts and various sizes of motor boats*



*The International Rift through which runs the line dividing the United States from Canada. At its narrowest point this waterway is only 20 feet wide, but is navigable by any craft having a draft not in excess of 4 feet. On the right is La Rue Island on the Canadian side, and on the left is Wellesley on the American side*

facilities for storing the motor boat with living quarters for the owner or his servants on second and third floors built well above the water. Such boat-houses may often partake of the nature of a comfortable cottage built over the water's edge, and the occupants of such a dwelling can combine all the advantages of a shore life with those of house-boating. Naturally, those establishments maintaining a steam yacht and a number of motor boats will also require the services of a larger number of attendants and domestic servants, and it is logical that their quarters should be provided in the space available above the boat-house proper. To the occupants of such a ménage, the much-sought-after back door key becomes the even more desirable key to the ignition switch of the servants' motor boat which represents their connecting link with shore and whatever activities may be supplied by the small villages forming the nucleus of the summer settlements.

The motor boat on the St. Lawrence River takes the place, not only of the passenger auto-



*A combination of housing facilities for a steam yacht or large cruising motor boat and a smaller motor boat*

mobile, but of the taxi, trolley, the railroad train, the express wagon, the grocery delivery wagon, and even of feet, for, except for swimming, a stout pair of legs appeals but little to the owner of a snug island domain. In consequence, the man who would consider it the height of luxury and extravagance to own more than one automobile finds use for from two to a dozen motor boats of varying sizes and speeds.

The accommodations for such a fleet give excellent opportunity for attractive architectural design and interior arrangements in the construction of the boat-houses. If a steam yacht or large cruising motor boat with signal masts is maintained, its accommodations would naturally be provided under the central part of the boat-house where the peak of the roof gives the greatest room for the masts. Slips and doorways for smaller craft may be provided on either side, until finally the kicker without top or flag poles may be neatly tucked under the eaves. It is not necessary that a single slip and doorway be provided for



*An attractive combination of luxurious living quarters, skiff boat-house, motor boat slips, and ample docking facilities for guests' craft*



*The boat-houses, belonging to the estate of the late George Boldt, are among the most elaborate on the St. Lawrence and include servants' quarters connected with accommodations for three steam yachts or cruising motor boats and a dozen or so smaller craft*

each of a large fleet of motor boats, as several of the smaller type may share the docking facilities provided by the two sides of a slip of moderate size.

But the famous St. Lawrence skiff with its seaworthy qualities so suitable for fishing and shallow waterway navigation is by no means a discontinued model, and the well-built boat-house must provide space for one or more of these craft. Such skiffs, however, will not necessarily be kept in separate slips but will be pulled out of the water on inclined ways and rollers when not in use, and stored on a level floor generally provided with hardwood cleats so that contact with the keel takes place at but two or three points.

During the summer time when the motor boat is in almost constant use the boat-house serves principally as a convenient hitching post and cover to protect the interior from rain. It should, of course, be provided with a work bench, and in some instances, with a small machine shop man whose duty it is to keep boats in condition every facility repairing and over-engines as well as more important however, is the

*Upper view.—The summer home of Gilbert O. Rafferty includes an attractive stone boat-house of a design in keeping with the cottage*

*Lower view.—Many of the islands of the St. Lawrence are scarcely more than tree clad rocks which may be made a pier or dock by the owner*



providing some means at the end of the season for raising each boat out of the water to protect it from the scratching and crushing effect of the ice which will treat the stoutest hull as the frailest egg shell. The stout piers, forming the foundation of the boat-house, offer an excellent base for the erection of marine screws or winches for raising the boat bodily out of the water and resting it on timbers set across the slip. In the case of a small boat a set of pulleys installed in the heavy timbers of the roof may be used to raise the craft from the water, but the heavier motor boat will require screws rigidly placed in the cribs and piers of the boat-house.

As the motor boat on the St. Lawrence represents the nucleus of the islanders' comfort and enjoyment, so should the housing of the indispensable craft represent the nucleus of the summer home. This is well exemplified in the boat-houses of the Thousand Islands.

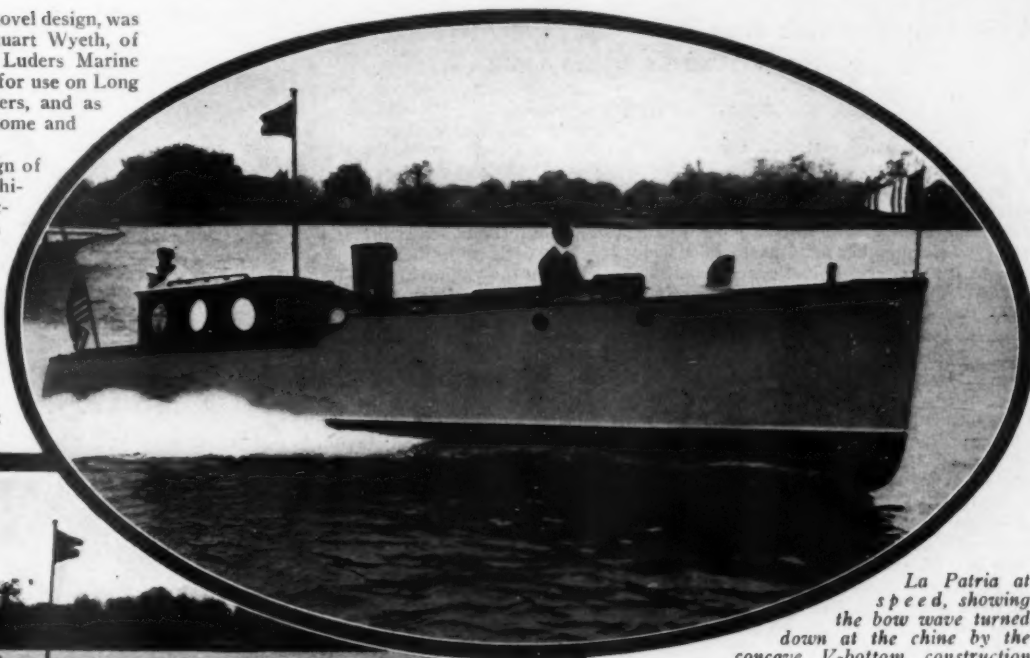


*At the summer home of Alexander Robb the simple and yet commodious boat-house has been designed in keeping with the attractive cottage placed farther back on the same island*

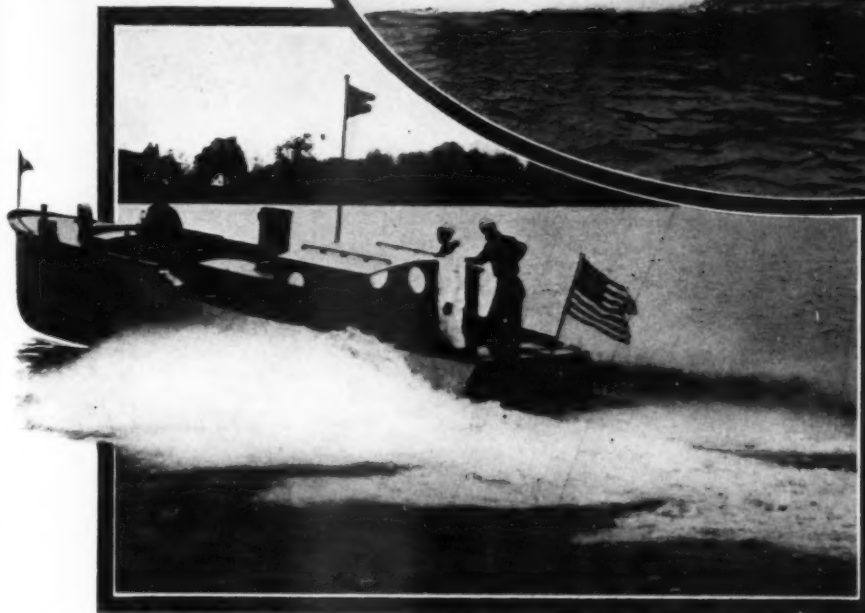
## La Patria, A Fast Runabout

**L**A PATRIA, a runabout of novel design, was recently completed for Stuart Wyeth, of Philadelphia, Pa., by the Luders Marine Cons. Co., of Stamford, Conn., for use on Long Island Sound and similar waters, and as a ferry between his summer home and New York.

The requirements in the design of this boat were speed, seaworthiness, and a permanent protection for the passengers. As worked out they have produced a runabout that is almost in the day cruiser class. The raised-deck type of hull together with ample reserve buoyancy produced a boat that even at high speed will lift easily when running into a head sea, and keep the deck



*La Patria at speed, showing the bow wave turned down at the chine by the concave V-bottom construction*



*Above—The light shelter cabin over the passenger cockpit is a most acceptable addition to a runabout. At right—Interior of the motor compartment with side panels removed*

of upwards of 25 m.p.h. than drive through the dense traffic with the numerous stops and then when once out of the city complete the journey in an endless cloud of dust raised by every other machine on the road.

### La Patria

Length over all.....	36 feet
Extreme beam.....	8 feet
Draft.....	2 feet 6 inches
Motor.....	175 h.p. Van Blerck
Speed.....	31 1/4 m.p.h.
Owner.....	Stuart Wyeth

Photographs by Rosenfeld

free of solid water and wind driven spray.

There is a small cabin under the raised deck forward for storage and supplies that is provided with a patent storm-proof ventilator and two port holes on each side, giving the boat somewhat the appearance of a small express cruiser.

The boat is handled from the cockpit at the after end of the raised deck, where the steering wheel and motor controls are located on the bulkhead. The cockpit floor is raised at this point forming a sort of navigation bridge and raising the helmsman high enough to get an unobstructed view ahead.

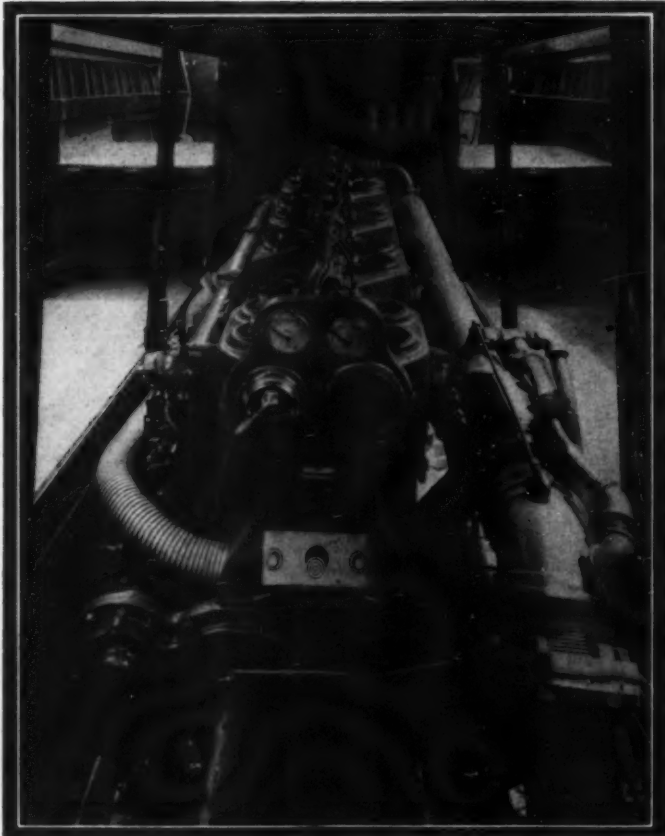
One of the most novel features of this boat is the housing over the motor. This is built with permanent ends and roof, but with sides of removable panels. This provides a real shelter for the motor and at the same time gives free access to all of the mechanical equipment for adjustment or repairs. Ventilation, an important feature with a motor of this size, is secured by means of the stack over the center of the engine enclosure. The illustration shows very clearly the interior of the engine compartments and how accessible the various parts are when the side panels are removed. It will be noticed that the cockpit floor is much lower alongside the enclosure than at the forward end.

Accommodations for the guests are provided in the large cockpit aft of the motor compartment. A light shelter cabin with large port holes covers the forward half and provides pro-

tection from wind and rain. Furnished with comfortably upholstered seats and wicker chairs it is a most enjoyable place to spend an afternoon on the water.

Motor boatmen in greater numbers every year are coming to appreciate the fast runabout or express cruiser as a most desirable means of transportation between their suburban home and office in the city. Traveling in this way they are not forced to ride in hot, crowded cars, or be at the station promptly or miss their train.

Some may suggest an automobile, but who would not rather travel over the water at speeds



# Iris, a Houseboat Cruiser

A 35-Footer Which Was Built for \$1,500 During One Motor Boatman's Spare Time

By P. G. Andrews

THE high cost of materials together with the abnormal wages paid by the larger ship yards has made the cost of a new motor boat reach such a price that the prospective owner thinks twice before placing his order—and often changes his mind as to how badly he needs his new craft. Not every man, however, is disappointed. Some pay the price, and others, those who really get the best there is out of the sport, take off their coats and do the work themselves.

Such was the case with the owner of *Iris*, a 35-foot bridge-deck cruiser, having a beam of 9½ feet and a draft of 3 feet. Although it took practically every Saturday afternoon and Sunday for eighteen months to complete the work it was well-worth the time and work involved and \$1,500 worth of material. *Iris* has proved an able, seaworthy craft and a real comfortable cruiser to live on.

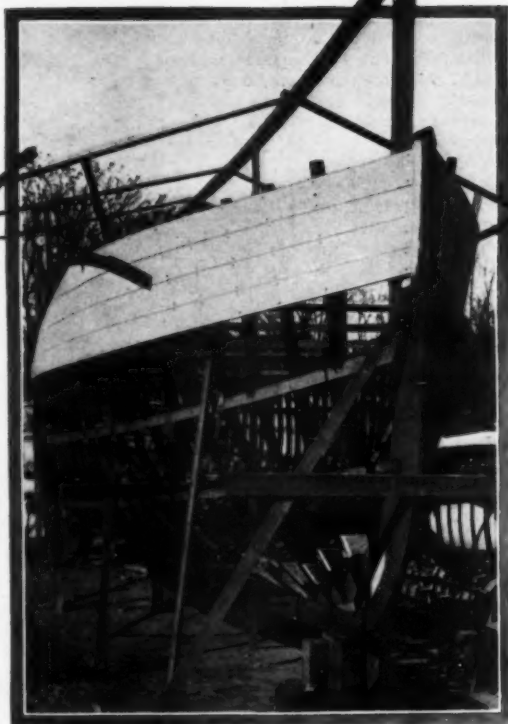
The best of materials were used throughout. The keel is of oak in one piece, 6 inches deep and sided 5 inches. The oak frames are securely fastened to 2-inch oak floors with a 4 x 4-inch oak keelson over them, the whole being securely fastened together by galvanized iron rivets through the keel and keelson. The planking is ¾-inch cedar, not over 6 inches wide. The joiner work is cypress throughout.

The general arrangement, as shown in the

can be made aboard the boat.

The motor, an engine taken from an automobile truck, is installed under the bridge deck with the fly-wheel in the engine-room. Two 25-gallon gasoline tanks are mounted under the after part of the bridge and feed by gravity to the carburetor. Each tank is fitted with a gage glass such as is used on steam boilers so that the amount of gasoline they contain is always visible. As it is 20 feet from the reverse gear to the propeller, the first 12 feet of shafting is steel and the after 8 feet is 1½-inch bronze shafting. The motor turns the 22-inch diameter, 22-inch pitch Columbian wheel at 500 r.p.m., giving a cruising speed of 8 m.p.h. All controls are brought to the bridge deck within convenient distance of the steering wheel.

The galley, or more properly called the kitchenette and ice-box are built in under the seat at the after end of the bridge, opening

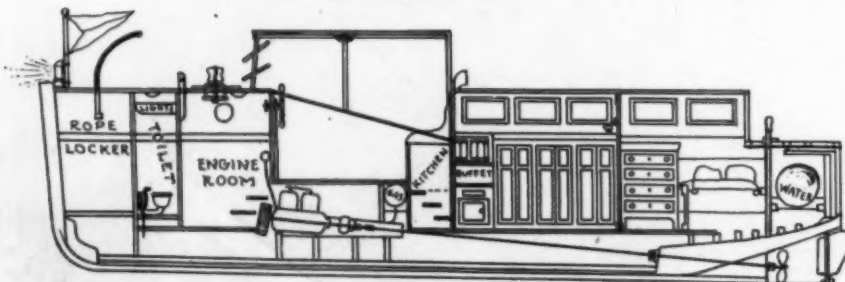
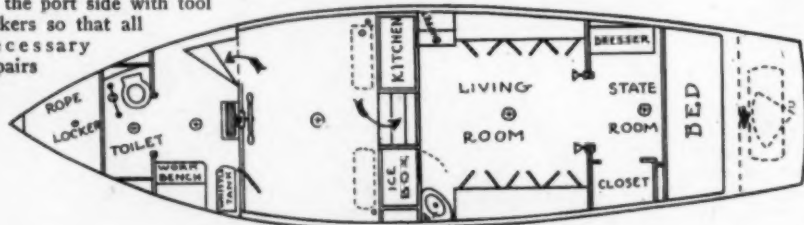


*Iris* in frame, just after the planking had been started. The substantial construction is clearly shown



drawings, is a large size rope locker forward in the peak, followed by a toilet. The rest of the space under the raised deck is taken up by the engine-room, where a work bench is built on the port side with tool lockers so that all necessary repairs

The high freeboard assures a dry boat as well as ample headroom in the cabins



Inboard profile and cabin plan showing the general arrangement of the cabins

into the main cabin. The kitchenette is 3 feet wide, 2 feet deep and 2½ feet high and metal-lined throughout. Ventilation is assured by a 3-inch cowl on the cabin trunk roof.

The space below the sash in the main cabin is partitioned off into lockers, and as there are no built-in seats, there is plenty of room for chairs and a table. A buffet is built into one corner, and a porcelain wash basin directly opposite. The main cabin is entered from the bridge deck, the four steps being forward of the bulkhead so that no companionway is necessary.

The stateroom in the after end of the cabin trunk contains a double berth, dresser, and wardrobe, and is separated from the main cabin by a partition and curtained doorway. A 45-gallon water tank is installed under the stern deck. An air pump is provided so that the water is fed to the lavatory by pressure.

In laying out the cabin, both under the raised deck forward, and in the trunk aft, particular attention was paid to the question of headroom. To be a comfortable place to live in, the cabin must have sufficient headroom for the occupants to stand upright without bumping their heads. As this boat was built to live aboard and comfort was considered of greater importance than appearance, 6 feet 2 inches of headroom was provided throughout.

The joiner work in the main cabin is of



Main cabin and stateroom in background. The absence of built-in seats allows the use of a table and chairs

cypress, the trim stained dark brown and the balance left natural color. No varnish was used, the finish consisting of three coats of linseed oil, each coat being allowed to dry hard before applying the next. The forward cabin is finished in light gray paint and the space under the bridge is painted white.

The electric lighting system includes the sailing lights as well as those in the cabin. One

feature that is original with this boat is the recesses in the hull for the port and starboard sailing lights. This does away with lamp screens, is a permanent installation, and protects the lamps from damage or breakage.

The deck equipment includes some novel features. The windshield is in two parts, pivoted at the side so as to provide for ventilation and at the same time keep out the rain. An oblong hole is cut through the deck over the engine-room extending from the bulkhead to the windshield to provide for ventilation when the hatch is closed. The cover for this opening is a sheet of plate glass mounted in

a hinged frame, and is used as a chart case. As the charts could not be put into the frame without folding they were cut in two and pasted back-to-back on a piece of linen. They were then water-proofed by saturating them in a solution of paraffin in gasoline.

All scuppers and drains leading outboard are carried below the waterline where they do not show and no sea cocks were used. The connections to the fittings through the planking are made with rubber hose so that no strain or vibration is transmitted to the planking to cause leaks at these points.



Head on view of Iris under way



Looking forward from the bridge deck, showing the windshield and combination chart case and engine-room ventilator

## The Motor Boat Supply Ship

Commonly Called the Bumboat

By F. T. Lander

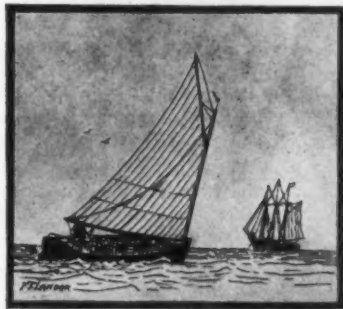
IF a fellow happens to be an idle worthless sort of being, of no consequence at all, he is very apt to be classed as a bum. An object also is given this epithet when possessing similar characteristics, yet when we speak of a bumboat we find a craft so extreme in ability to make itself useful and of general worth that not infrequently it becomes the most popular one in the entire fleet.

To most people the term is suggestive of "Pinafore" and is regarded no doubt by many as taking its origin therefrom, but in reality the bumboat has been plying its trade for centuries in one form or other throughout every corner of the globe.

This type of craft is defined as being a small boat used by hucksters to carry supplies of provisions, trinkets, clothing, etc., to ships lying in port or off shore. Although the records show that the word was first used in English in the Trinity House By-laws of 1685, relative to boats attending ships lying in the Thames, it is supposed to be connected with the Dutch bumboat or boomboat, a broad Dutch fishing boat, the derivation of which is either from boom, a tree, or from bun, a place where fish are kept alive; and boat, a boat.

To that vast and ever-increasing flotilla of sail and motor boatmen who are responsive to the call of Lloyds, a harbor quite unique in many ways, the bumboat needs no introduction; but those who have yet to experience for the first time the beauties and charm of this sheltered nook will discover there a means of replenishing the larder that not only will save no end of lugging but will become one of the events of the day.

Here will be found a man who serves you from a boat laden deeply with garden truck



A sailing bumboat of the days gone by

in season. Dairy products also are a feature, but the climax comes when from a great basket is handed over the rail a loaf of home-made biscuits still warm from the early baking. To the hungry man a better looking rowboat never showed itself than that which makes the rounds before breakfast time.

The Hudson River has had, and still has, its share of bumboats. In the early days before rail communication between New York and Albany or the intermediate towns, all traffic was handled by water and as the time consumed in making the voyage was often of considerable length, a field was opened to the bum

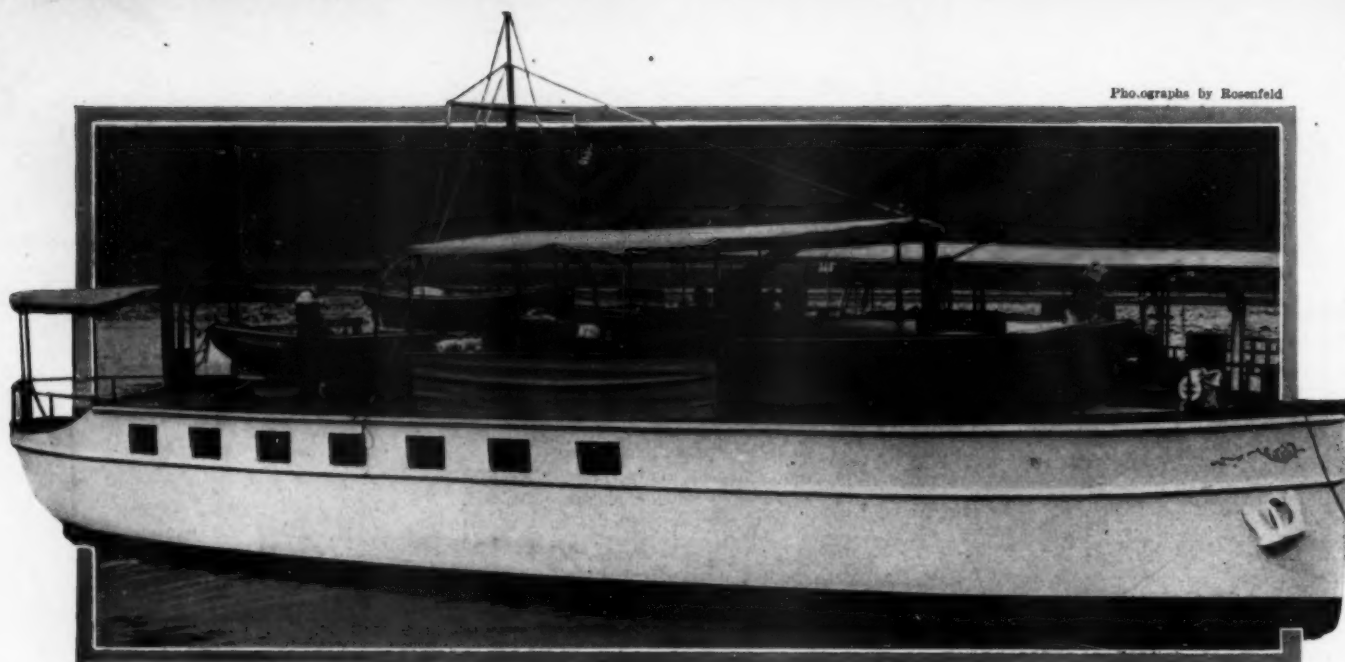
boatmen that immediately proved profitable. Various means of propulsion have been employed by these rivermen. For a long while the small steam launch predominated, and while the sail and rowboats are still used to a certain extent those driven by the gasoline engine have almost entirely replaced the others in serving those long heavy strings of barges, canal boats and miscellaneous craft that constitute the tows.

In foreign lands the bumboat becomes a familiar sight. When there are no docking facilities these aquatic peddlers ply their trade

(Continued on page 88)



A familiar figure at Lloyds Harbor.



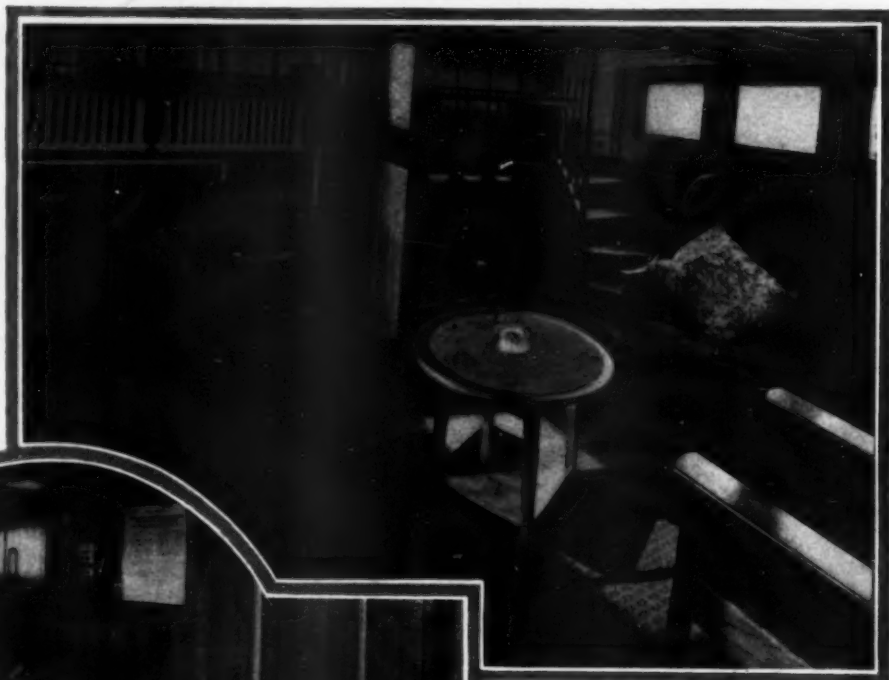
Photographs by Rosenfeld

*Harmar is owned by H. A. Weston, of Jacksonville, Fla., and is admirably suited to cruising in the shallow southern waters*

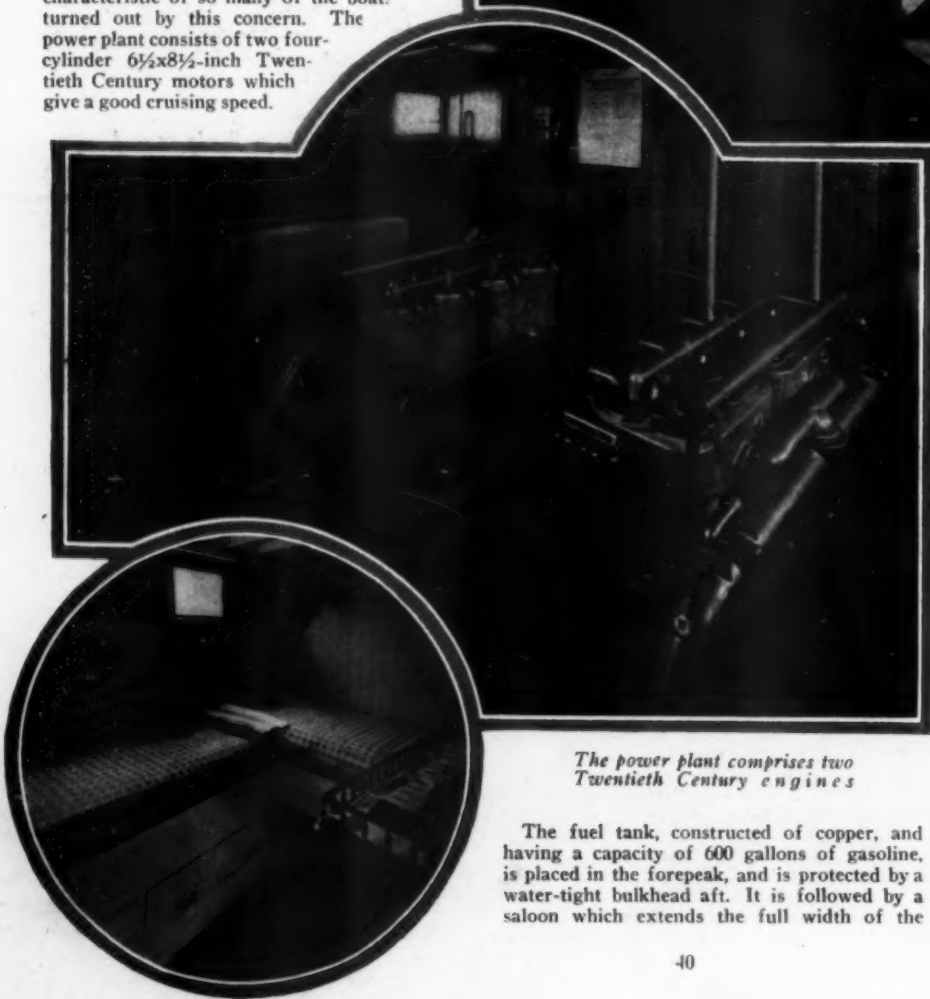
## Harmar

**A Houseboat Cruiser of Light Draft, Heavy Construction, and Fine Underbody Lines**

**H**ARMAR is an attractive 65-foot houseboat cruiser owned by H. A. Weston, of Jacksonville, Fla., and used by him for all the year cruising in southern waters. She was designed and built by the New York Yacht, Launch & Engine Co., of Morris Heights, N. Y., and her hull is of the sound, heavy construction which is characteristic of so many of the boats turned out by this concern. The power plant consists of two four-cylinder  $6\frac{1}{2} \times 8\frac{1}{2}$ -inch Twentieth Century motors which give a good cruising speed.



*The main saloon forward is a cheery, comfortable apartment of unusual roominess*



*The power plant comprises two Twentieth Century engines*

The fuel tank, constructed of copper, and having a capacity of 600 gallons of gasoline, is placed in the forepeak, and is protected by a water-tight bulkhead aft. It is followed by a saloon which extends the full width of the

boat and is 12 feet in length. This compartment is furnished with deep, comfortable transoms, armchairs, and table, is well lighted and ventilated, and is heated with a hot water system. A companionway on the port side aft leads to the bridge, and a central passageway runs aft and gives access successively to the bathroom, two staterooms, the dining saloon, and the galley. The dining saloon is about 8 feet long and is located on the port side, while the galley is about opposite it.

Following the dining saloon and galley is the engine-room which in addition to the main power plant is equipped with a separate electric lighting outfit, and the usual work bench and tool equipment. The crew's quarters and toilet are also located toward the stern of the boat, and a fresh water tank of 400 gallons' capacity is placed under the after deck.

With overall and waterline lengths of 65 and 60 feet respectively, Harmar has a beam of 16 feet and a draft of only  $2\frac{1}{2}$  feet. As the depth of water in many of the rivers and canals of the South is not much over 3 feet Mr. Weston will be able to reach many of the secluded spots barred to large boats.

Photographs by Kellar & White



Powered with a 130 h.p. Speedway motor, this cruiser attains a speed in excess of 20 m.p.h.

## Ahdeek

A Comfortable Day Cruiser of 38-Foot Length Which May Also Be Used by a Party of Three or Four for Extended Cruising

**B**UILT primarily for service as a day cruiser, the Speedway cruiser Ahdeek offers also adequate accommodations to permit of extended cruising for a party of two to four persons.

In general model the boat is of the accepted displacement type of rather high freeboard and generous flare. Ahdeek has proven to be exceptionally able in a seaway and has attained an average maximum speed of 20½ miles an hour.

The chain locker is arranged in the forepeak, followed by a toilet room which has an entrance into the main cabin immediately aft. This cabin is arranged with two transom berths having lockers under, and is well lighted and ventilated. A galleyette at the after end includes ice-box, sideboard and alcohol

### Ahdeek

Her owner...H. V. Schieren  
Her builder.....Seabury  
Her motor.....Speedway



The cockpit is an unusually spacious one. The motor is installed under a cover about amidships

### Ahdeek

Her length...38 feet  
Her beam...8 feet 3 inches  
Her draft...2 feet 9 inches

stove in its equipment. The boat is equipped with electric starting apparatus and is electrically lighted throughout.

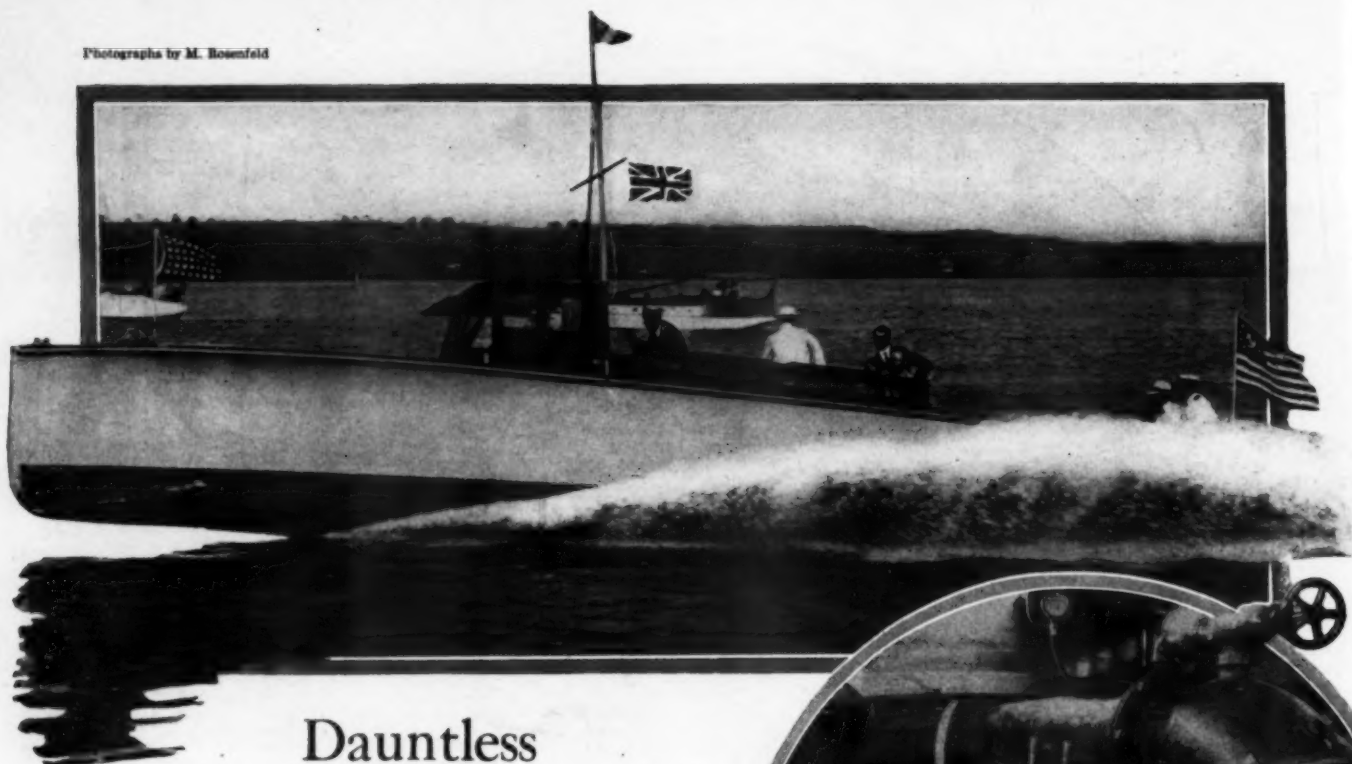
The motor is installed about amidships under a removable cover, on top of which the steersman's seat is built. This engine is a Model M four-cylinder 5¾ x 7-inch Speedway, developing 130 h.p. It is fed from a 150-gallon copper tank under the after seat in the cockpit, the fuel lines running outside the hull to the engine compartment. The fresh water tank, constructed of copper with tin lining, is installed under the cabin floor. The interior joiner work is in white enamel and mahogany. The cockpit is very spacious and is comfortably furnished with six Wicker Kraft chairs in addition to the usual lazy-back stern seat.

Ahdeek was built by the Gas Engine & Power and Chas. L. Seabury & Co., Cons., of Morris Heights, N. Y., to the order of H. V. Schieren and was used by him last summer at Great South Bay. She measures 38 feet in overall length by a beam of 8 feet 3 inches and her greatest draft is 2 feet 9 inches.



The trunk cabin is arranged with two comfortable transom seats, galleyette, etc.

Photographs by M. Rosenfeld



## Dauntless

A Connecticut River Express Cruiser With Several Novel Features—A 35-Mile Speed With 350 H. P.

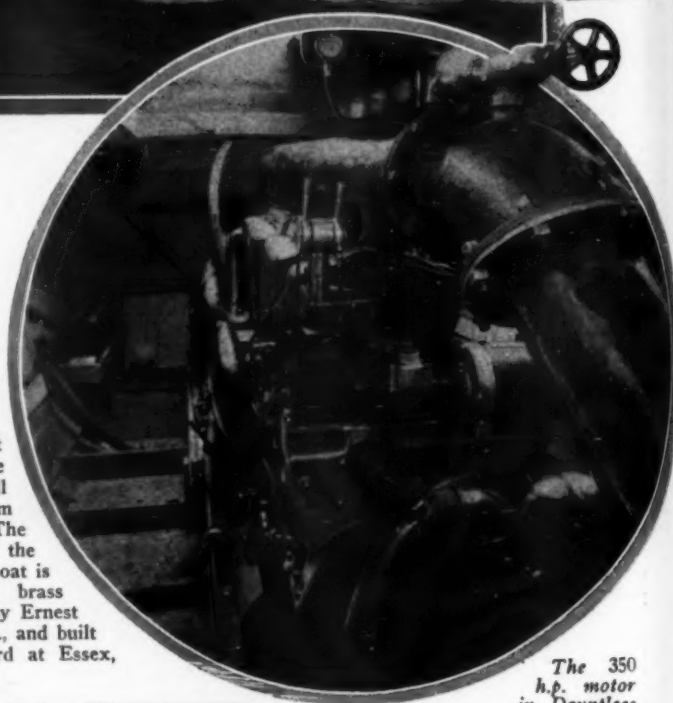
CONNECTICUT RIVER motor boatmen have been startled more than once this summer by a strange craft rushing by them at railroad speed. Hardly would they notice her coming before she was gone. The cause of all this commotion was Dauntless, a 45-footer powered with a 350 h.p. eight-cylinder Duesenberg motor and owned by R. T. H. Barnes, of Hartford, Conn.

In design and arrangement Dauntless is decidedly different from anything which has gone before her. One feature which is particularly appealing is the pilot house forward which gives a maximum amount of comfort to the helmsman, a decided point of advantage in any boat traveling 35 m.p.h.

The cabin has sleeping accommodations for

five persons and is entered through the pilot house. The motor room measures 15 feet in length for the full width of the boat.

A large, open water-tight cockpit extends from the motor room to the stern. All of the exterior wood and trim is finished in mahogany. The frames are white oak and the planking is of cedar. The boat is fastened throughout with brass screws. She was designed by Ernest N. Way, of Hartford, Conn., and built by the Dauntless Ship Yard at Essex, Conn.



The 350 h.p. motor in Dauntless

## Sectional Patrol No. 86

S. P. 86 being the abbreviation for sectional patrol and designated as No. 86 by the Navy Department is very similar in design and appearance to the motor patrol boats of which some fifty were built for the Russian Government by the Greenport Basin & Construction Co., of Greenport, L. I.

No. 86 is owned by Capt. J. J. Phelps, of Hackensack, N. J., and was designed by J. W. Hussey. She is powered with

a pair of eight-cylinder Duesenberg motors having a 6¾-inch bore by 7¾-inch stroke and developing 280-360 h.p. No. 86 is equipped with a Columbian Ailsa-Craig propeller. A speed of 30.05 knots is claimed with the motors turning 1,225 r.p.m.



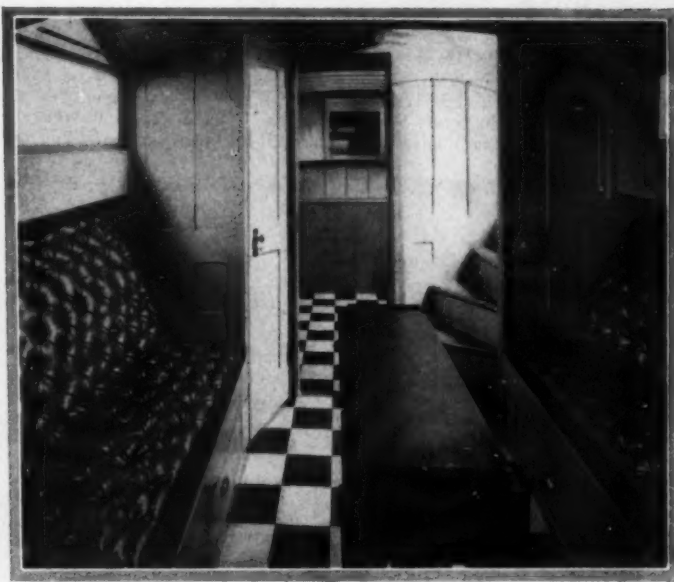
S. P. 86 is powered with a pair of eight-cylinder Duesenberg motors which give her a speed of 30.05 knots, it is claimed

# Black Watch a 22-Miler

A Round-Bottom Boat With 250 H. P. Which Already Has Proven Most Satisfactory



The galley



The main cabin

**T**HAT the round-bilge boat makes a satisfactory and seaworthy craft for a speed in excess of 20 miles per hour is demonstrated in a recent design by Tams, Lemoine & Crane, of New York City, and owned by Mrs. Pauline Ferguson, of Port Washington, L. I., which has been named Black Watch.

This boat has an overall length of 55 feet, a beam of 10 feet and a draft of just under 4 feet, making her an ideal outfit for either inland or offshore cruising. Even for southern work the draft of Black Watch is not too great to prevent navigating the inland passages.

With a six-cylinder Duesenberg Patrol Model motor developing 200-260 h.p. and swinging a 26-inch diameter by 22-



inch pitch Hyde propeller at 1,247 r.p.m. a boat speed of about 22 m.p.h. is claimed.

In interior arrangement of Black Watch is not unlike many other motor cruisers of this year. In the bow ample sized crew's quarters are provided for with the usual amount of locker space, etc. The motor is located partly under the bridge deck, but not in quarters which are cramped in any sense as is generally found in too many modern craft.

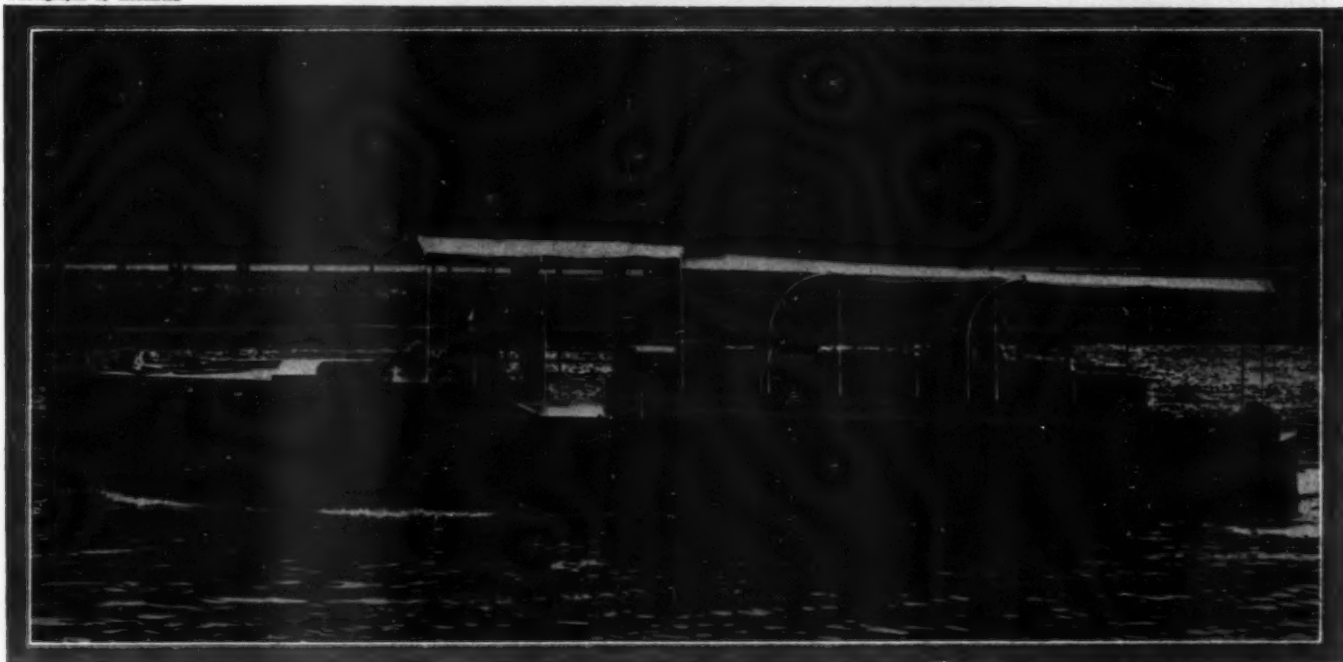
Two full width staterooms and the galley are located aft of the motor room.

The deck arrangement is especially attractive. There is a large sized bridge deck forward and a sunken cockpit aft.

Black Watch was built by the New York Yacht Launch & Engine Co. of Morris Heights, N. Y.

The 200-260 h.p. Duesenberg motor installed in Black Watch

Black Watch underway during the builder's trial trip  
Photographs by Rosenfeld



## A Fast 35-Footer

A 125 H. P. Van Blerck Motor, Operating at 1,500 R. P. M., Drives Nymph at a Speed of 28 Miles Per Hour—Suitable Not Only for Racing But for Long Distance Pleasure Cruising

**N**YMPH, a displacement speed boat, is one of the most attractive of last season's vintage. She is the latest addition to the fleet of racing craft owned by Louis H. Eisenlohr, and has distinguished herself in

average speed of 22.785 nautical miles, or 26,197 statute miles an hour. At Sea Isle City she was the only displacement racer to come to the scratch and made an exhibition run around the course of 12 nautical miles, in similar time.

engine compartment may be had by means of hinged hatchways.

The interior accommodations of Nymph are well laid out.

Mr. Eisenlohr is a member of the Camden

Photographs by Joseph N. Pearce



*Nymph is a heavily constructed runabout designed by Bowes Mower for Louis H. Eisenlohr*

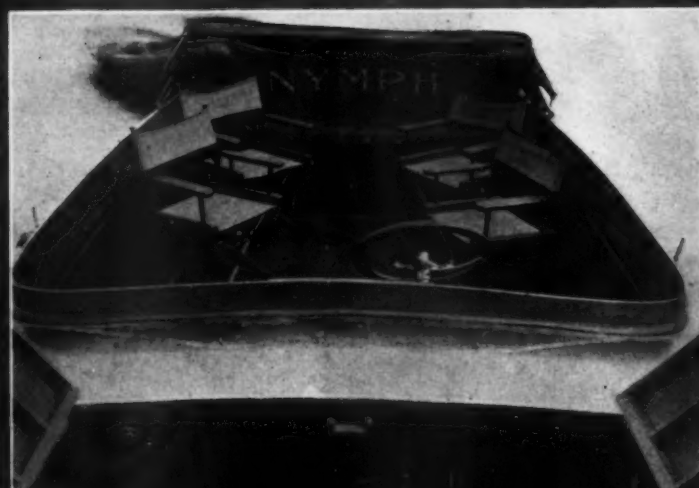
many races since her completion in 1916.

Nymph was designed by Bowes & Mower and built by the Reeder-Alexander Boat Building Co. She is 35 feet long by 8 feet beam and has a draft of 30 inches. Her motive power consists of a six-cylinder  $5\frac{1}{4}$  x 6-inch 125 h.p. Van Blerck motor, which turns a 20x28-inch Columbian propeller at 1,500 r.p.m. With this efficient engine installation she is capable of a speed of 28 statute miles per hour.

In the many races in which she took part, Nymph was driven by Henry Bowes with Wilbur Van Sant acting as mechanic. The races include the South Jersey Association Championship; the Record Trophy Championship of the Delaware, and the Championship

She captured the Barnegat Bay Championship by endurance and good speed.

This 35-footer has been designed not only for racing but for pleasure cruising. Her spacious



*The built-in seat and four camp chairs with which the cockpit is furnished affords comfortable accommodations for guests*

of Barnegat Bay. Besides taking part in the various races, Nymph has covered a distance in pleasure cruising of over 3,800 miles.

Nymph made her first appearance in the racing game at the opening of the South Jersey season at Holly Beach Yacht Club. In this race she had a tussle with J. M. R., and it was only through her consistent work that she won the race. She made the 20-mile course in 54:09, and made her best lap at an

cockpit affords comfortable accommodations for eight persons. It is fitted with a built-in seat and space for four camp chairs besides leaving plenty of room for the helmsman. A one-man auto top covers the entire cockpit. Access to the

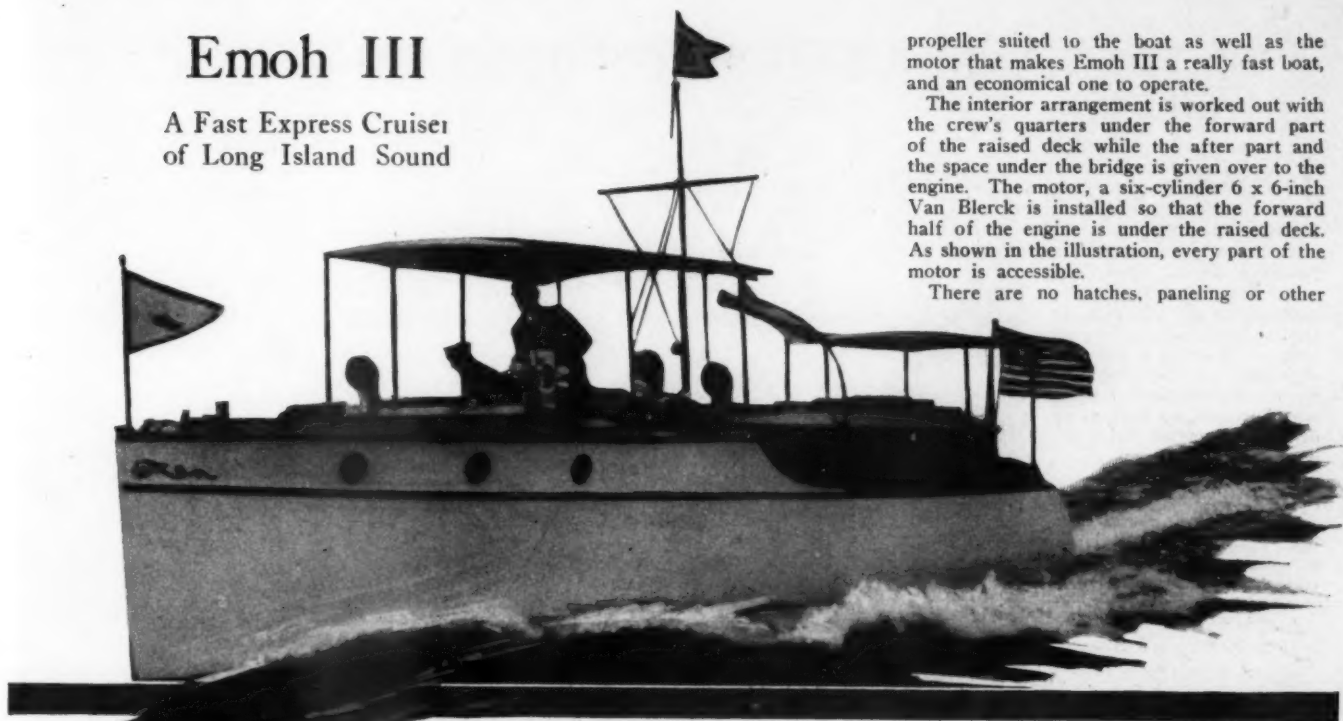


*The six-cylinder Van Blerck motor which gives a speed of 28 m.p.h. is installed forward under the hinged hatchways*

Motor Boat Club; the Cape May Yacht Club; the Corinthian Yacht Club of Philadelphia, and the Wellwood Yacht Club, of Northeast, Maryland.

# Emoh III

A Fast Express Cruiser  
of Long Island Sound



*Emoh III is an express cruiser that any man should be proud to own, and is a credit to the builders, the Greenport Basin & Construction Co., of Greenport, L. I.*

Photographs by Rosenfeld

**W**ITHOUT question one of the best designed express cruisers on Long Island Sound is Emoh III, owned by C. H. Sunderland, and sailing from New Rochelle. Mr. Sunderland wanted a boat that would be fast and at the same time one that he could live aboard in comfort. He wanted a real cruiser with a speed of not less than 20 m.p.h., and a motor so installed that it would be easily accessible and could be given proper attention without doing acrobatic stunts to get at it.

When Mr. Sunderland had finally worked out the type of boat and the interior arrangement that would best suit his purpose he took his ideas to Frederick K. Lord. From these ideas Mr. Lord worked up the finished plans of Emoh III, a 43-foot express cruiser with a beam of 8½ feet that can easily make 25 m.p.h. as a sustained cruising speed. What is more, this speed is attained with a remarkably efficient slip, a slip that would be considered as small in a much slower boat. It is the combination of a well-designed underbody and a

*The engine-room layout can well serve as a model for boats of any type. Every piece of equipment is easily accessible*

*The main cabin finished in mahogany and white enamel presents a most pleasing appearance. It is readily converted into two separate staterooms*



obstructions to be removed. The control rods, piping to gauges, and the wiring to the instruments and switches are all in the open and carefully installed in the most direct manner.

The trunk cabin aft of the bridge contains the galley and toilet at the forward end, followed by the main cabin that can be partitioned off into two staterooms with one folding double berth in the forward part and two folding double berths in the after part. The main cabin may be entered from either the bridge deck or the cockpit aft, while the engine-room and crew's quarters are entered by a companionway leading from the bridge deck.

# America's Largest Motor Boat

Aramis, a 157-Foot Diesel-Powered Yacht

IT is through the progressive ideas of America's yachtsmen and naval architects that the largest Diesel yacht is American built, powered and owned. It is not only in the power plant that Aramis differs from the usual yacht of similar size. The whole design is a radical departure from the earlier models with clipper bows, long overhanging sterns and high masts. Neither has Aramis the appearance of a small size destroyer, as have some of the large motor yachts recently built.

The plumb bow and rounded stern, the slightly raised fore-castle, steel deck houses with few windows, and a large navigating bridge give this craft a decidedly able and seaworthy appearance.

Aramis was designed by A. Loring Swasey, of Swasey,

Raymond & Page, of Boston, Mass., for Arthur H. Marks, and was built in the yards of Robert Jacob, at City Island, N. Y. The hull is of steel throughout, having an overall length of 157 feet, 23 feet beam and 7½ feet draft

and a displacement of about 225 gross tons.

The rail and other deck trim is of teak as is the finish of the after deck house, which is used as a music room and main saloon.

An unusual feature for a yacht is the large organ that has been built into this deck house in such a way as to carry out the general decorative scheme.

The dining saloon is in the forward deck house and is finished in silver-gray oak trim with hand-painted furniture and draperies to match. The owner's and guests' state-rooms are below deck, reached by a large stairway leading down from the music room. All of the staterooms are finished in white with mahogany trim. Built-in berths are used throughout instead of the brass beds found in so many yachts but that always seem

*The furnishings throughout are most elaborate*



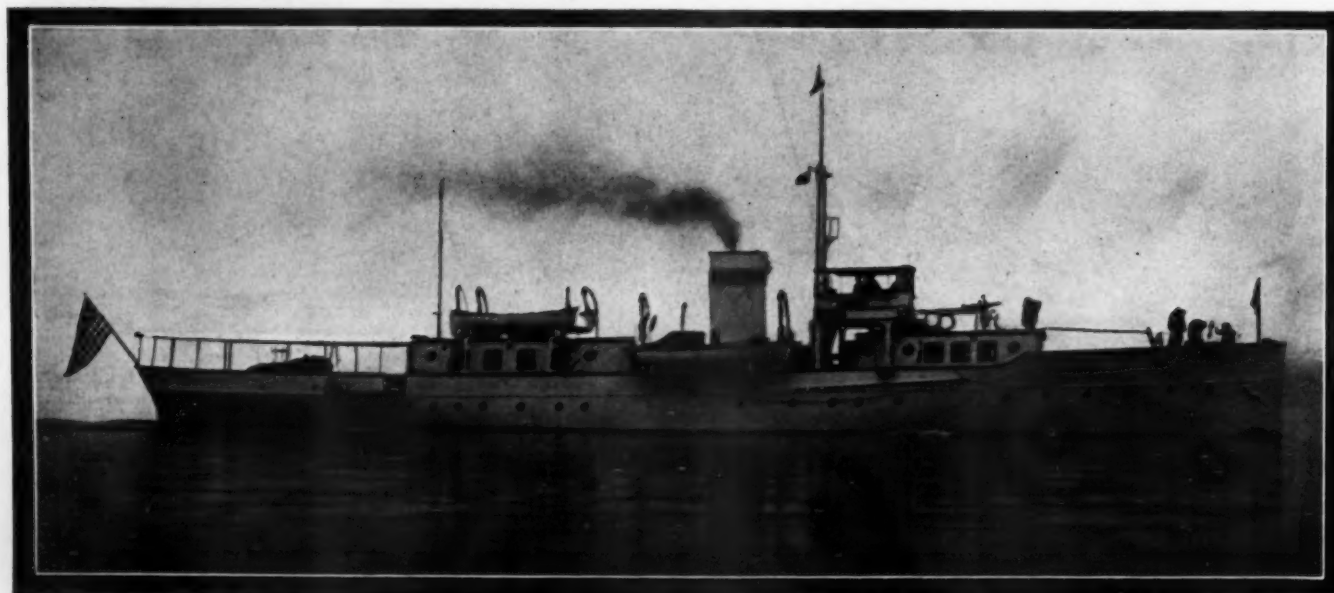
*The dining saloon is finished in silver gray*



*One of the guests' staterooms finished in white and mahogany*



*Another of the guests' staterooms, showing the elaborate furnishings*



*With the raised fore-castle, steel deck houses, and large navigating bridge Aramis presents a most seaworthy appearance*



The two six-cylinder Craig-Diesel motors that give Aramis a speed of 14 knots at a cost of \$1.40 per hour

to be so much out of place aboard a ship.

Every comfort and convenience has been incorporated into the construction and equipment of this boat. There is a high-powered wireless plant that enables the owner to keep in touch with his business and the events of the day even when far from home ports.

A Sperry gyroscope stabilizer has been installed in the engine-room that will prevent the ship from rolling badly even in a heavy sea. The stabilizer is mounted on a steel bed much the same as the engines, and is separated from the rest of the engine-room by a pipe railing.

The engine-room is provided with a large work bench and ample facilities for making repairs to the machinery. Chain hoists traveling on steel I-beams directly over the motors enables the cylinders and other large heavy parts of the engines to be handled with ease when making repairs or adjustments.

Undoubtedly the most interesting feature of Aramis is the big six-cylinder Craig-Diesel motors that develop 350 h. p. each and operate at 300 r.p.m. These motors were built by the James Craig Engine & Machine Wks., of Jersey City, N. J., and represent the latest development in this type of power plant. They are full Diesel, air-starting and direct reversible.

As shown in the illustration these motors are no more complicated than a gasoline engine of the same power. Each cylinder has four push rods actuated by one camshaft in the base. These push rods control, by means of cranks on the cylinder heads, the inlet and exhaust valves, the fuel supply, and the air for starting. The camshaft is provided with a double set of cams, one for running ahead and one for

#### ARAMIS

Length overall.....	157 feet 6 inches
Extreme beam.....	22 feet 5 inches
Draft.....	7 feet 6 inches
Motor .....	Craig-Diesel
Speed .....	14 knots
Designer .....	Swasey, Raymond & Page
Builder .....	Robert Jacob
Owner .....	Arthur H. Marks

astern. For reversing it is only necessary to move the camshaft forward or aft so that one or the other sets of cams come under the push rods.

Diesel motors consume approximately one-half pound of oil per horsepower hour so that these two motors will develop 700 h.p. with a consumption of only about forty gallons of oil per hour. The economy of this power plant is evident when it is considered that the fuel costs only about three and one-half cents per gallon, or \$1.40 per hour to operate the plant. Compare this with the cost of operating a gasoline power plant of equal power on gasoline. At twenty-five cents per gallon the cost would be about \$23 per hour.

For some unexplained reason the owners and designers of large yachts have not taken advantage of Diesel motors to such an extent as have the commercial boat interests. It is very probable that once the economy and advantages of this type of motor have been demonstrated in a large motor yacht it will entirely supersede the steam plant. It is cheaper to operate, requires much less space for a given amount of power and can be operated by a smaller crew than the steam-powered boat.

In steel yachts the fuel oil can be stored in such places as the double bottom, in tanks formed by steel plates on the inside of the frames or in tanks stowed away almost anywhere, which is a great saving of space when compared with that required for coal. Then too, the dust and dirt always incident to coal-ing ship is avoided. The oil is delivered aboard through a hose directly to the filling connections of the tanks. Aramis has been taken over by the Navy and has undoubtedly proved its value as a patrol boat for offshore work.

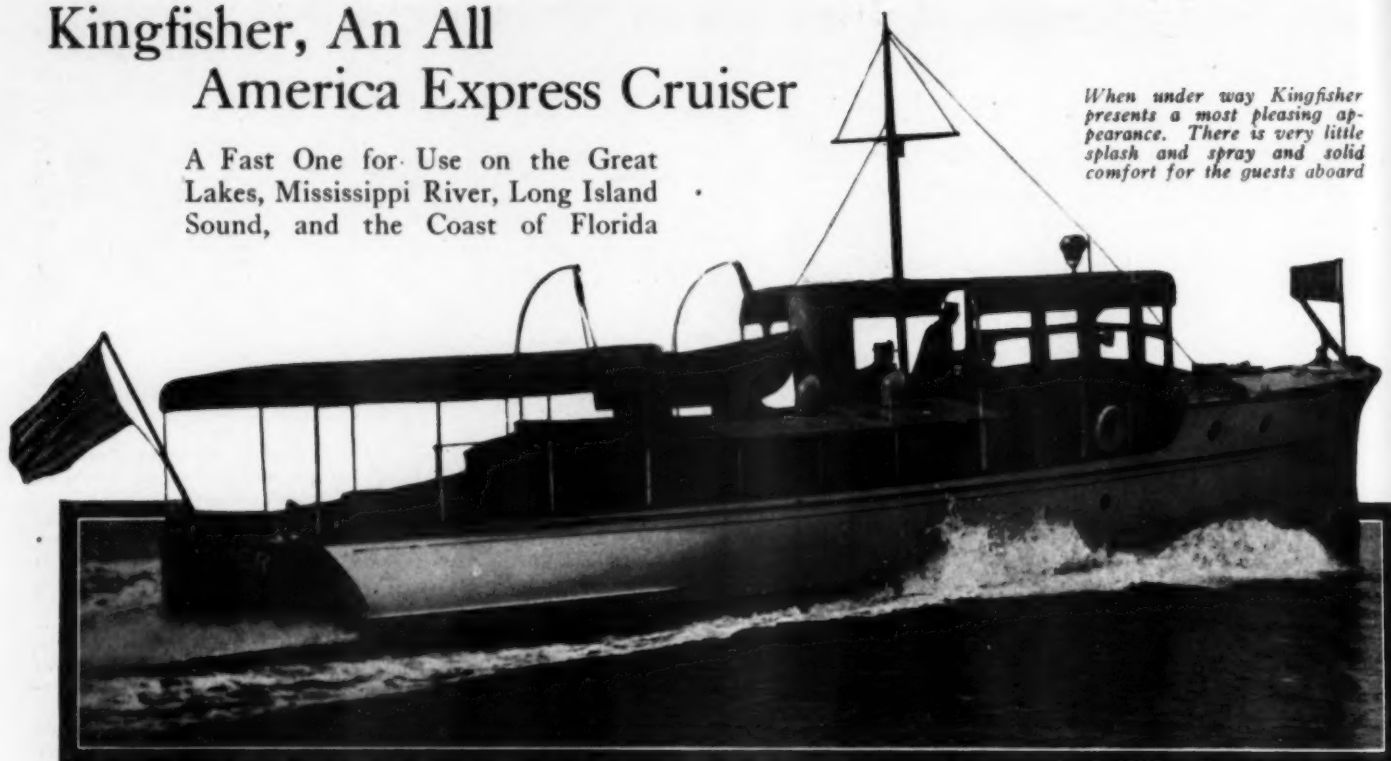


The music room with its open fireplace and deeply upholstered furniture is most inviting

# Kingfisher, An All America Express Cruiser

A Fast One for Use on the Great  
Lakes, Mississippi River, Long Island  
Sound, and the Coast of Florida

*When under way Kingfisher  
presents a most pleasing ap-  
pearance. There is very little  
splash and spray and solid  
comfort for the guests aboard*



ONE of the attractive express cruisers recently completed is Kingfisher, owned by E. L. King, of Winona, Minn. As Mr. King follows the seasons, so to speak, he required a boat that could stand the open waters about New York during the spring and fall, he used

at his estate, Rockledge, on the Mississippi, during the summer, and yet be able to navigate the shallow waters about his winter home at Daytona, Fla. Mr. King has had considerable experience with boats of various sizes and demanded comfort and convenience as well as a fair turn of speed in his new express cruiser, Kingfisher.

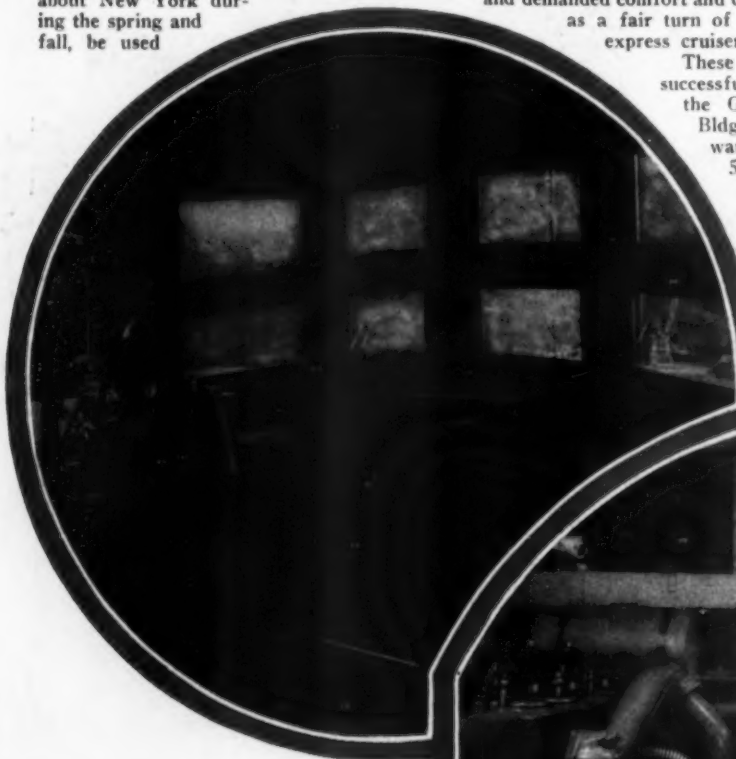
These conditions were successfully worked out by the Great Lakes Boat Bldg. Corp., of Milwaukee, Wis., in this 56-footer with 11-foot beam and only 28 inches draft and driven by two six-cylinder 6x6-inch Van Blerck motors with electric

starting equipment, at a speed of 26 m.p.h.

The general arrangement is a chain locker in the peak followed by refrigerator of unusually large dimensions that extends across the full width of the boat. The rest of the space under the raised deck is about equally divided between the galley and the main cabin. Upper and lower berths provide sleeping accommodations for four persons.

The engine-room is located in the forward end of the trunk cabin and extends under the bridge deck. In addition to the main power plant there is also a Delco generating set for lighting the boat and operating a 1,500 c.p. Carlisle & Finch searchlight. The engine-room also contains three pipe-frame berths for the accommodation of the crew. Ventilation is secured by means of two large cowls and six port holes.

The after part of the trunk cabin is taken up by the owner's stateroom. At the forward end is a large lavatory on the port side, a wardrobe and dresser on the starboard side and a spray bath in the center connecting with the lavatory. In the after part are two extension berths and four large lockers.



*There are few boats on which the helmsman is as well protected as on this bridge. For all practical purposes the substantial windshield is every bit as good as the pilot house found on Pacific Coast boats*

*The arrangement of the engine-room is such that all parts of the power plant are accessible and there is ample working space all around the motors. The independent lighting generator is as carefully arranged as the two big main motors*



# Celeritas, A Fast Twin Screw 60-Footer

An Express Cruiser for Ferry Service  
Between New York and Ossining

THE problem of the most satisfactory and comfortable method of traveling between his summer home at Mt. Kisco and his business in New York City has been solved by David Goodrich. The railroad was reliable but the cars were hot and uncomfortable in the summer, and, of course, it was necessary to be at the station on time or miss the train. An automobile could make the trip at any time

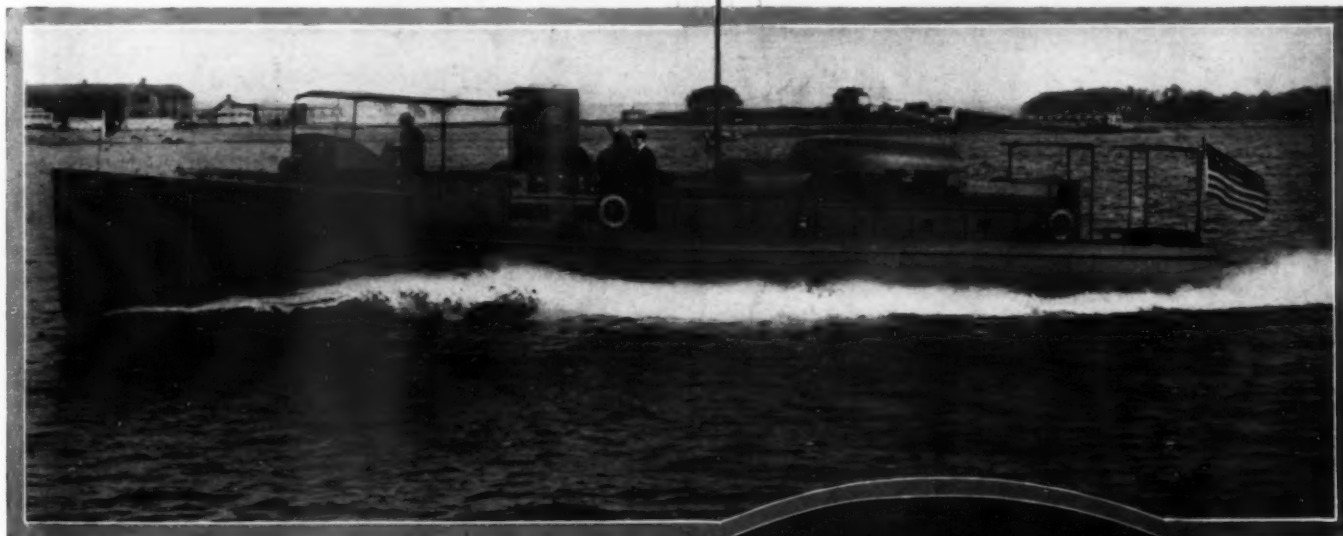
operating on the New York Central through Ossining, Peekskill, and the other river towns.

This remarkable cruiser, Celeritas, round-bottom, dis-type and was de-Swasey, Raymond South Boston, built at the yards

express is of the placement signed by & Page, of Mass., and of Robert

Jacob, at City Island, N. Y. The two 125-200 h.p. eight-cylinder Model F Sterling motors give this craft a sustained cruising speed of 28 m.p.h.

The interior is arranged with the crew's quarters under the raised deck forward and entered by a hatch immediately behind the windshield of the bridge deck. The engine-room is located aft of the bridge deck in a



*Celeritas is one of the few boats with no bright work above decks. It is painted battleship gray throughout*

but took longer than the railroad, and was not entirely certain.

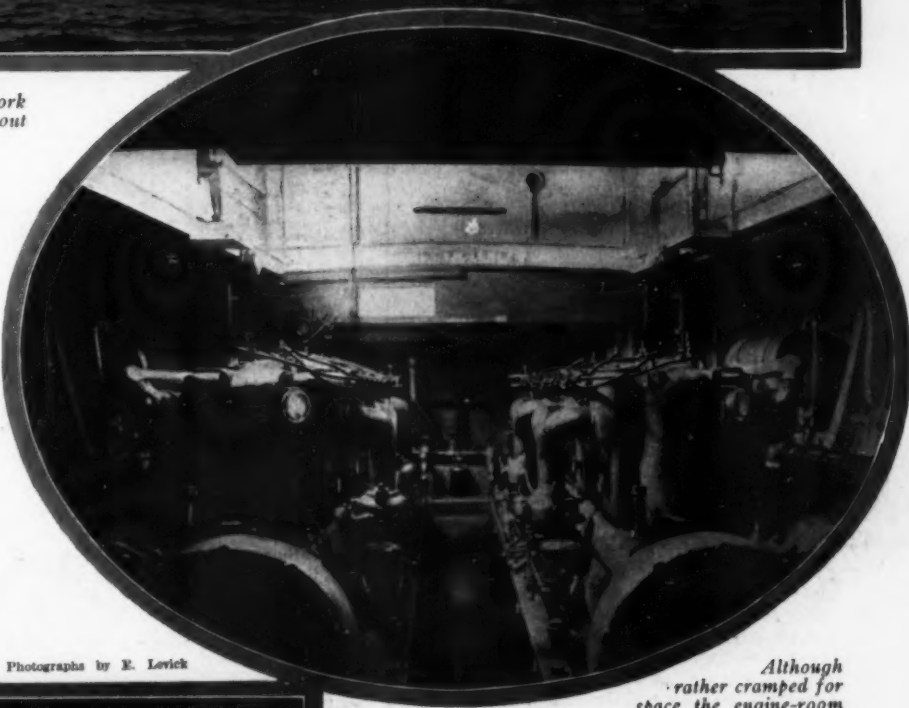
The solution was found in an express cruiser, a real fast one, that makes the trip up the Hudson River from the Battery in New

## Celeritas

Length Overall.....	60 feet 9 inches
Extreme Beam.....	11 feet 5 inches
Draft.....	3 feet 3 inches
Motor.....	2 eight-cylinder Sterlings
Speed.....	24 knots
Designer.....	Swasey, Raymond & Page
Builder.....	Robert Jacob
Owner.....	David Goodrich

York City, to Ossining, N. Y., in a little over one hour and lands Mr. Goodrich within four miles of his home. The remaining distance being covered by automobile. No difficulty is found in keeping pace with the local trains

Photographs by E. Levick



*Although rather cramped for space the engine-room is well lighted and ventilated*

*Simplicity is the keynote of the entire boat, as shown by the arrangement of the bridge, without sacrificing the comfort of the owner or guests*



low trunk cabin. This arrangement provides better light and ventilation than is usually found in the engine-room of boats of this size and type.

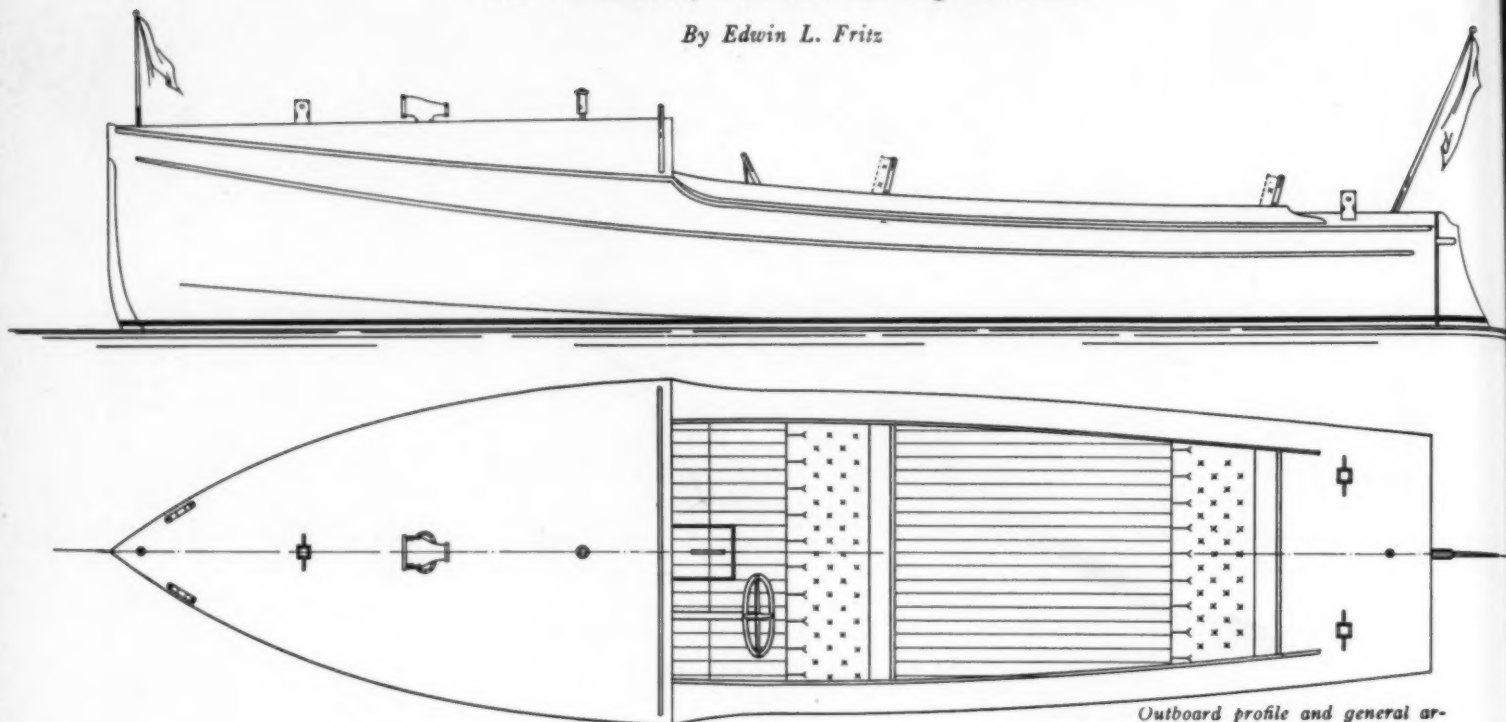
The main cabin, owner's stateroom and guests' stateroom are located in the trunk cabin that extends from the engine-room to the small deck aft. This cabin can be entered from either amidships, from the stern deck or at the forward end.

As Celeritas is not intended to carry a large party the deck accommodations are rather limited, but a comfortably upholstered seat is built in the front end of the engine-room trunk and there is space for several wicker chairs on the stern deck. A substantial windshield in front of the bridge and weather cloths at the sides furnishes adequate protection to the man at the wheel.

# My Ideal Runabout

## No. 7—America, a 21-foot Cruising Runabout

By Edwin L. Fritz



Outboard profile and general arrangement. Scale  $\frac{3}{8}$  inch equals one foot

**I**N spite of how large our ideas may be, many times in order to carry them out one must place them on the same scale as his purse, which fact was borne in mind by the writer when contemplating his Ideal Runabout. From that standpoint I speak.

What I consider my ideal is a small craft of low initial cost, of proportionate upkeep and running expense, with good speed; capable of seating six or seven persons comfortably, and taking them safe and dry through any waters that a boat of its size might venture into; also one which can be used for week end camping trips and extended summer vacation tours for a party of two or three persons.

My craft is 21 feet in length, with a beam of 5 feet 7 inches over all. The underbody is V-shaped throughout, slightly flared forward to throw off the water in a rough seaway. The after sections are fairly flat, but enough V to prevent pounding at anchor or in a rough sea. The square bilges make the boat entirely steady and stiff for so small a craft and at the same time allow the entire width of the cockpit floor to be used, which ordinarily proves inadequate.

As seen from the plans, the freeboard is extremely high for so small a craft, which is quite an asset in rough weather, with a breakwater mounted on deck about amidship to prevent any flying spray from finding its way into the cockpit, as from experience the writer cannot lay too much stress on a craft built to the contrary. As will be noted, it has the appearance of a raised deck, with good crown, to allow easy access to the motor compartment without cutting hatches in the deck. This is a decided improvement, as I have yet to see water-tight hatches that will stay so in a craft of minimum construction.

The hull is very substantially built, but at the same time is not over weight, the frame throughout being of oak and the cedar planking finished one-half inch, with Georgia pine battens screwed under each seam, making a type of boat that will never leak, except through the stuffing box, if the building is carried out half way professionally.

The decks are of  $\frac{3}{8}$ -inch cedar, finished bright, while coamings,

### My Ideal Runabout

America, the seventh of the series of Ideal Runabouts, is a 21-footer that is intended to be used as a runabout and as a cruiser for week end trips. One of the most novel features is the engine compartment forward. When a boat is to be used for long trips it is essential to the comfort of those aboard to have ample locker space that is absolutely dry. This is accomplished by omitting the usual hatches in the forward deck, giving the deck a good crown and providing access to the motor through the bulkhead.

To provide sleeping accommodations at the end of the day's sail it is only necessary to remove the panel under the after seat, spread the cushions or air mattresses on the cockpit floor and a double berth 7 feet long by 4½ feet wide is ready. The cabin is completed by the canvas cockpit cover, buttoned to the forward deck and coaming.

The hull is of the V-bottom type with ample freeboard, a necessary feature in a boat to be used in rough waters or for long trips. The construction is of the usual seam-batten and station frame type, well braced and tied together with heavy floor timbers.

fenders, lazy backs, rudder, and seats are of white ash, highly polished, which is far superior in my mind to oak, as it will not turn black under weather conditions. The fastenings and fittings throughout are of copper, brass and bronze; in fact every part of the boat and its equipment is the best to be had upon the market, my desires being for a small boat with the best of finish and equipment rather than a larger boat with mediocre finish and equipment which could be built for the same price.

The first 9 feet from the stem is covered by the raised deck and contains the engine and all its equipment. This is separated from the

rest of the boat by a bulkhead on which to centralize the boat's controls, making it a true one-man craft and one extremely easy to handle.

On the port side is placed the auto steering wheel, with engine controls, gauge lights, kick switches for lights, ignition system, air gauge, electric plugs, controls for whistle, air and bilge pumps.

The starboard side of bulkhead is removable, giving instant and easy access to the motor compartment. The next 2 feet is the operator's cockpit with reverse lever at his right hand and an instantly removable hatch for reverse gear. We then have the operator's seat of 16 inches, covered with tufted cushions that can be used in an emergency as a life preserver, as they contain an unsinkable packing. These lazybacks are of the removable type. Below this seat is placed the main gasoline tank of 30-gallon capacity, bulkheaded in to meet the requirements of the insurance underwriters.

The following 5 feet 7 inches is an open cockpit with ample room for four good comfortable chairs, the floor being covered with corrugated rubber, as in the operator's cockpit, having a removable hatch over the propeller shaft.

A comfortable seat, identical with the one mentioned above, and extending clear across the cockpit, takes up the next 16 inches.

Next we have 2 feet 6 inches after deck, below which swings the bronze quadrant that controls the rudder through a hole about 2 inches square in the transom. The outboard type of rudder, as herewith shown, is dominant

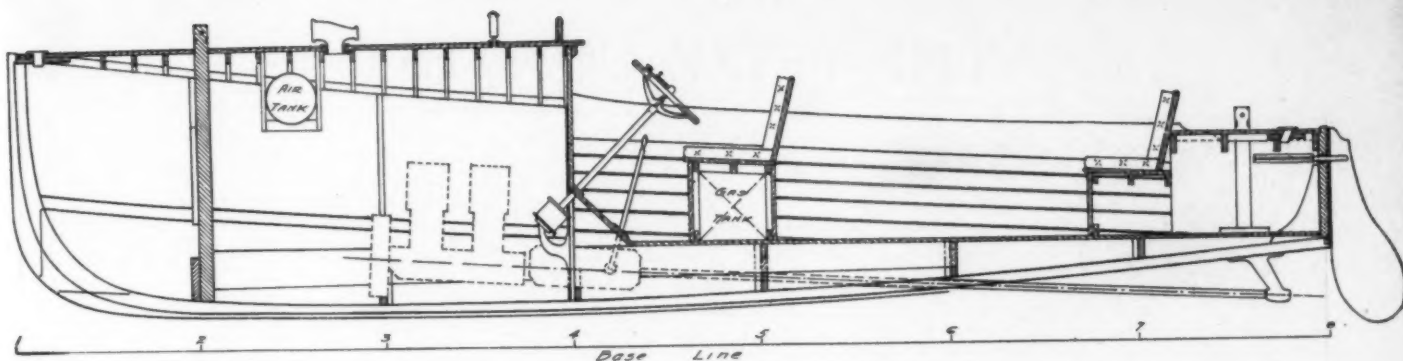
in the writer's mind for small sea-going boats as it gives instant control with but a touch of the wheel, having small strain on the steering gear.

Below the afterdeck there is a large locker, nothing too much on a small boat.

An engine sufficient to drive this craft at approximately 15 statute m.p.h. (but capable of being driven up to 23 miles by installing a larger machine) is one of a two-cylinder, two-cycle type, but of not too great a weight, with a 4-inch bore and a 4-inch stroke turning a propeller 15 inches by 20 inches of



America completed, a 21-footer in which long trips can be made



a two-blade type 1,000 r.p.m., a slippage of twenty-five per cent. being taken into consideration. This engine is installed just forward of the bulkhead, with carburetor and ignition controls leading to the steering wheel and with rear starting device on the after side of bulkhead, while in a box on the starboard side of the engine compartment will be found all necessary tools.

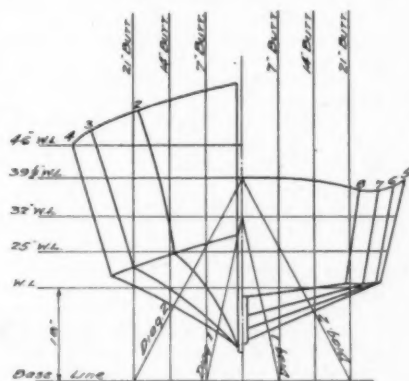
This engine is to be oiled by grease cups on the main bearings, while the rest of the engine is oiled with high grade cylinder oil placed in the gasoline, which after the writer's accustomed method has proved itself the most efficient. Will also state that after running a machine an entire season along this line, covering approximately 1,000 miles, he found in taking down the engine for winter storage that each and every part had a fine film of oil on it, with so slight a coat of carbon in the cylinders that it is not worth mentioning.

This compartment is ventilated by a syphon ventilator that really ventilates, while by the insertion of a removable bulkhead and one padlock the entire space under the forward deck is sneak-thief-proof.

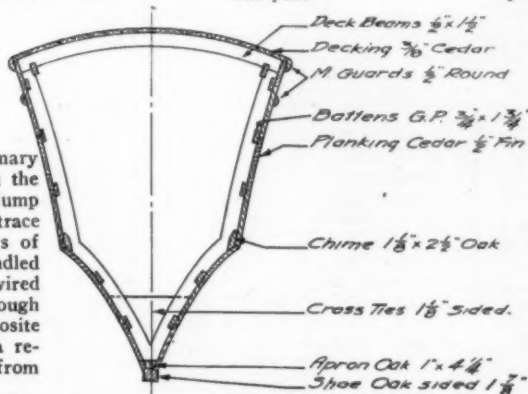
The electric current for both light and motor ignition is furnished by two six-volt, 80-ampere storage batteries, controlled by the kick switches on the bulkhead. All wiring should be of the best primary cable obtainable. The ignition system on the motor ought to be of the weather-proof, jump spark kind (Perfex), that has not given a trace of trouble to the writer after four years of experience with them in boating, if handled fairly decently. The batteries should be wired so that the current from No. 1 flows through the coils, vibrator, and plugs in the opposite direction of that of No. 2, resulting in a re-depositing of metals and of freedom from pitting at vibrator and plugs.

The lighting system consists of running lights, binnacle, and gauge lights, light in motor

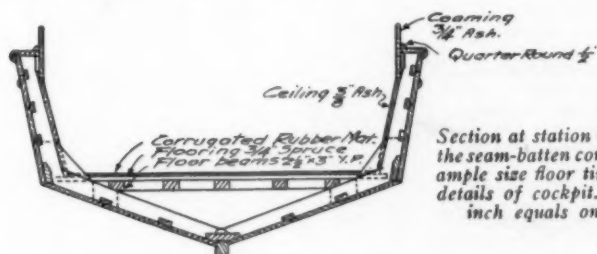
Inboard profile and lines at scale of  $\frac{3}{8}$  inch equals one foot



Body plan of America. Scale  $\frac{3}{8}$  inch equals one foot



Section at station 2 showing construction under forward deck. Scale  $\frac{1}{2}$  inch equals one foot



Section at station 6 showing the seam-batten construction, ample size floor timbers and details of cockpit. Scale  $\frac{1}{2}$  inch equals one foot

compartment, trouble light, and a 20 c.p. searchlight mounted aft of the ventilator, all fitted with tungsten bulbs to reduce consumption of current. The batteries supply ample current for the above, taking into consideration having them recharged at the rate of every eight to ten weeks, proving in itself but a minor expense.

The gasoline tank located below the operator's seat has not sufficient pressure of itself to feed the carburetor in a seaway. For this reason we are installing a 3-gallon tank, slightly forward of the engine, to which the gasoline is forced under 3-pound pressure by an air pump driven by the flywheel. It is also taken care of by a hand pump located on the outside of bulkhead at operator's left hand for emergency purposes. This tank has a glass steam gauge to show the amount of gas in the tank and from here the gasoline flows by gravity through a strainer and is filtered before entering a carburetor. This in itself is a very useful point, as it is not a joke being in a seaway many miles from home and finding that the dead motor's stress is caused by soot in gasoline feed pipes. The pressure tank also furnishes air for blowing the whistle located forward of the searchlight.

When I say week end trips, it has many times been found that one had to put up in hotels for accommodations over night owing to so small a boat not having sufficient facilities for two or three persons to sleep in without having to be so doubled up that the following day's pleasure was handicapped. If anyone ever had occasion to sleep aboard a small boat over night and found that on awakening the next morning he had a lame back, stiff knees, and the feeling that his neck is wrenched from its socket after having rested it for several hours on an old tool box, battery holder, or engine

(Continued on page 84)

STATION	HALF BREADTHS										HEIGHTS ABOVE BASE LINE										DIAGONALS	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2
1	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41
2	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41
3	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41
4	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41
5	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41
6	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41
7	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41
8	1.00	1.15	1.30	1.45	1.60	1.75	1.90	2.05	2.20	2.35	2.50	2.65	2.80	2.95	3.10	3.25	3.40	3.55	3.70	3.85	1.41	1.41

All dimensions given in Feet, Inches & Eighteenths of an Inch

# THE PRIZE CONTEST

ANSWERS to the questions addressed to the Editor of Motor Boating, 119 West 40th St., New York, must be (a) in our hands on or before August 25, (b) about 500 words long, (c) written on one side of the paper only, (d) accompanied by the senders' names and addresses.

The name will be withheld and initials used.

QUESTIONS for the next contest must reach us on or before the 25th of August. The Editor reserves the right to make such changes and corrections in the accepted answers as he may deem necessary.

The prizes are: For each of the best answers to the questions below, any article or articles sold by an advertiser advertising in the current issue of Motor

Boating of which the advertised price does not exceed \$25, or a credit of \$25 on any article which sells for more than that amount. There are two prizes—one for each question—and a contestant need send in an answer to but one if he does not care to answer both.

For answers which we print that do not win a prize we pay space rates. For each of the questions selected for use in the next contest, any article or articles sold by an advertiser advertising in this issue of Motor Boating, of which the advertised price does not exceed \$5, or a credit of \$5 on any article which sells for more than that amount.

All details connected with the ordering of the prizes selected by the winners must be handled by us.

## Questions for the November Issue

1. What have you found to be the best method of smoothing up the hull of a boat when the plugs project beyond the surface of the planking and the putty has been forced from the seams by the swelling of the wood.

*Suggested by A. O. G., Portland, Me.*

2. \*Is the outboard motor a valuable adjunct to the tender of a medium sized cruiser and give your reason for your opinion.

*Suggested by E. M. T., New York City*

\*This question appeared through error in some editions of the July issue of MoToR Boating. Those contributors who sent in answers will receive consideration.

## Saving Your Boat in a Gale

Answers to the First Question in the June Issue

*"Describe a practical method of dropping a second anchor if the first drags in a gale so that the two will not foul."*

### A Difficult Task for One Man Anchors Can Be Dropped in Tandem

(The Prize-Winning Answer)

IF power and sufficient aid be available the best method of dropping a second anchor is to head up into the gale until you are about ready to trip the first anchor, now, by veering the craft somewhat away from the side on which this anchor lies the boat can be held on a line with the anchor but gradually moved over in a direction at right angles to the gale. When you have placed sufficient distance between the old anchor and the location of the second one drop this and while still keeping up to the anchors gradually work the boat over, by paying out on the new cable and hauling in on the old, until you are about midway between the two. Now gradually drop back, paying out equally on both cables as you go, until you have a sufficiently long lead on the cables and then belay. You will be riding to two anchors and the load should be distributed evenly. To do this operation successfully really requires three hands, one at each cable and one to mind the wheel and engine controls.

When the boat is not too large and no power is available and there is enough room, a second anchor can be got out by carefully pulling up on your anchor, then by suddenly letting out quite some cable and forcing the boat around so that the wind gets her partly on broadside she will be forced over in that direction. You can then throw out the second anchor and pull up on it until you feel it, and then slacken away until you have the proper lead.

The writer, in performing this maneuver, did not, however, care to trust to the new anchor alone, so, instead of hauling in left the cable slack and pulled up on the first anchor, permitting this to drag until it was judged to be about in line with the first. The cable was now permitted to run free, meanwhile hauling in on the second cable and when the boat was considered about midway between the anchors but some distance to leeward they were both payed out equally until a proper lead was secured.

As this was done alone and on a dark night it was a great satisfaction when the two anchors held, and as the job took quite some time and patient handling, not to mention several periods of mighty strenuous work, the writer was only too glad to turn in.

That experience showed one thing conclusively—it's much better to put down an anchor that may be considered too heavy in the first place. Dropping a second may be all right but it is entirely too strenuous a job to bear repetition if it can be avoided.

A. B., Scarsdale, N. Y.

WHEN lying at anchor in a strengthening breeze which threatens to assume serious proportions the usual procedure is to first pay out additional cable to the anchor which is on the bottom. When it becomes evident that one anchor will not suffice to hold the ship a second one should be made ready and, if weather conditions permit, it should be loaded into the tender and carried out ahead about abreast of the hook already down. A good method is to suspend the anchor over the stern of the dinghy by means of lashings which may be cut when the desired location is reached, thus avoiding the danger incident to letting go a heavy anchor from a small boat.

The anchors should be spread enough to keep them clear, but not much more than that amount. Perhaps twenty feet is about right. In cases where severe weather conditions will not permit the use of the tender the second anchor may be hove off the bow opposite that from which the first was let go. Care should be taken not to pay out too much cable on the first anchor before letting go the second as there will then be but limited scope available for the additional hook, since the strain must be equalized on the two cables.

A second anchor may be let go tandem with the first if preferred and this tandem method is in many ways an excellent one. The cable end of the first anchor put down is bent to the crown of the second and this is then let go, care being taken to prevent fouling as it goes over. The only fault with this method is that there is only one cable to take the entire strain instead of having two to rely on with the work divided between them. The holding power of the two anchors let go tandem fashion is greater than that of two anchors of equal weight on separate cables. There is, however, no tendency for the tandem anchors to foul in the bottom so long as the strain upon them is considerable.

When lying to two anchors with separate cables in a tide way great care is necessary to avoid fouling as the vessel swings with the tide. The only way to keep them clear is to get in one or sometimes both anchors when a tendency to foul is apparent and let go again in a clear position. The greatest vigilance is necessary to avoid an exasperating mix-up. For this reason one very heavy anchor and cable is often carried for emergency use and is really more practical than two anchors and cables of the usual size.

A. O. G., Portland, Me.

\* \* \*

### Maneuver the Boat by the First Anchor

WHEN it becomes necessary to throw over the second anchor because the first is dragging there is a certain amount of head work required along with the muscle and motive power of the crew and motors. Generally the wind is such that "He who hesitates is lost," and whatever is done must be done quickly.

To get over the spare anchor, work the boat off on an angle from the trend of the waves and ahead at the same time, so that there will be no chance for fouling, and let her go. Then put out a good length of cable, gauging the length of each cable so that there is a proportionate strain on each when the boat has dropped back.

The proposition is to work the boat ahead and off on an angle. With a good boat and motor this may be accomplished by running the motor and manipulating the anchor cable so that the strain comes about one-third the length of the boat from the bow.

With the motor out of commission the boat may be worked off from the direct line of the waves by changing the position of the fastening of the cable and utilizing the force of the wind and waves to work the boat off to the side.

### MOTOR BOATING'S

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The edition is limited so it would be well to send your order for the handbooks as early as possible to—Editorial Department, Motor Boating, 119 West 40th St., New York City.

This is best accomplished by throwing the anchor out of the chock or moving its fastening back from the bow and lashing it as far forward as possible by making a short line fast to the bitts, passing it through the chocks, around the cable and back to the bitts. By slacking off on this line the most efficient angle for working off may be found and should anything go wrong the cable can be quickly drawn in and the original condition restored.

Where conditions will allow the boat may be worked farther up into the wind and to the side by first working off on the opposite side from which it is desired to drop the anchor and when she will go no further reverse the position of the line and swing to the other side. The momentum thus gained will work the boat farther ahead on the second swing, then let go the anchor and drop back.

An extra length of heavy line being available the two anchors may be bridled and the spare line bent on to secure added scope. In rigging the bridle a knot used by steam boatmen to bend two lines of different size, or towing lines, together called a binder, is most suitable. By means of this knot two or more lines of any size may be securely knotted together so that they will hold up to the breaking strain of the rope and when dry can be undone without a marlin spike.

After the anchor cables have straightened out the approximate position of the two anchors may be determined from the angle of the respective cables. When the angle of the cables is dissected by an imaginary fore and aft line an equal strain would be on each cable. Since the heavier anchor has more holding power its angle should be correspondingly smaller. This angle between the cables will also give warning should dragging continue, by closing up. Even then the liability of fouling is very remote.

W. B. M., Newburgh, N. Y.

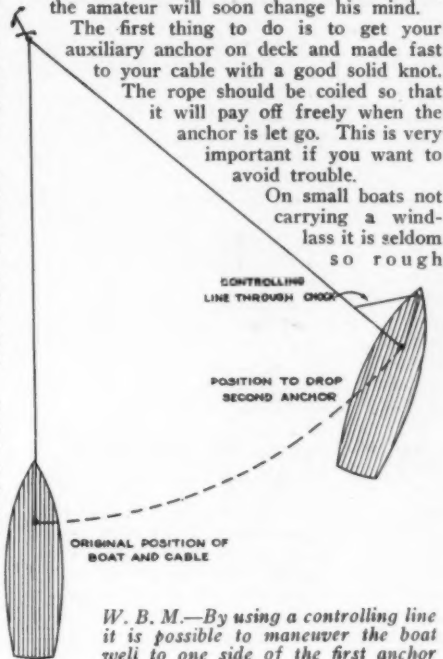
## Have Everything Ready Before Letting Go the Second Anchor

ANYONE who has weathered out a hard blow in an unprotected harbor has probably had more or less trouble with the anchor dragging. Practically the only remedy for this is to put out another anchor, and while this does not at first thought sound hard, the amateur will soon change his mind.

The first thing to do is to get your auxiliary anchor on deck and made fast to your cable with a good solid knot.

The rope should be coiled so that it will pay off freely when the anchor is let go. This is very important if you want to avoid trouble.

On small boats not carrying a windlass it is seldom so rough



that the cable can not be taken in enough to bring the boat nearly over the anchor. It is better to bring the boat up just far enough so that when the second anchor is thrown it will land to one side of the first. In heaving, let it go on the opposite side from the one already out and well to the side. Then let the boat back until the first anchor takes hold and make both ropes fast.

On larger boats the general plan is the same except the windlass will have to be used to bring the boat up to her anchor.

It is advisable, if possible, to have some one who is used to going on deck to do this, as it is quite easy to go overboard, when the boat is plunging around in a heavy sea. If you are in a narrow place and the use of the windlass only makes the boat drag more, you had better start up your engine and run up on your cable that way. This, however, is a bother and should be avoided whenever possible. Another method may be used in an emergency, providing you have plenty of rope and plenty of room to swing in. Let your second anchor go where you are and then pay out on the first anchor rope until the second has scope enough to hold well. This method is unseamanlike and rather unsatisfactory, for with the change of the tide you must even up the ropes so that the strain will come on both anchors.

No matter how you place your anchors, unless one is right on top of the other, there will be some difference in the length of the ropes. In the first method I described this difference is so small that it is best, unless you are in very close quarters, to let the one on which the strain comes drag until the other one takes hold again.

In the few heavy blows I have been in this method has always worked well and I see no reason why it should not.

W. L. W., Windsor, Conn.

## How to Back, Land, and Maneuver at Slow Speed

Answers to the Second Question in the June Issue

*"Explain the action of a boat's propeller and rudder when backing and give instructions for maneuvering both with motor going ahead and reversed."*

### The Action of the Rudder Is Effected by Many Things

(The Prize-Winning Answer)

THE action of a boat when backing and filling depends mainly upon the rudder design and position and the direction of rotation of the propeller. This relation of the hull to the rudder and propeller is a subject not any too well known by most men operating motor boats.

The simplest case is that of a boat being towed on a long line from the extreme bow. Here there is no propeller race and when the rudder is in a direct fore and aft line, the water flows around each side of the stern, producing an equal pressure on each side of the rudder and the boat runs true. When the rudder is put over at an angle the equilibrium of pressure is destroyed and the increased pressure causes the boat to swing off in the direction the rudder is turned.

The lateral plane of the hull, which is the submerged side of the boat, resists the turning, preventing a very sharp turn, and holds the boat on a course. The farther aft the rudder is placed from the center of the lateral plane the greater the leverage and the easier the boat turns.

Aside from the rudder, the propeller has a marked influence on the turning of a boat. A single-screw boat with a right-hand propeller will bear off to port if the rudder is let go. A right-hand propeller is one that turns clockwise, i.e., the top turns from left to right when driving the boat ahead. The bottom of the propeller turns in water less dis-

turbed by the hull, and in water more dense than the upper part of the wheel. This tends to roll the stern to starboard and the bow turns to port.

The inclination of the propeller shaft also tends to throw a boat off from a straight course. The descending blades of a right-hand propeller works on the starboard side and the shaft angle produces the effect of an increased pitch, thus shifting the center of thrust to that side tending to swing the bow to port.

The water from the propeller is not thrust straight back but tends to diverge with a rolling motion. The rudder in this propeller race is subjected to an unequal pressure on its sides from this whirling motion of the water. The part of the rudder above the pressure of this whirling race on its port side, and the lower part receives the pressure on the starboard side. In a deep rudder which extends to the bottom of the propeller these pressures equalize, but with a shallow rudder the pressure overbalances on the top part (port side) which tends to swing the stern to starboard and bow to port.

As soon as the propeller begins to turn and before the boat makes headway the rudder is in the propeller race, and the boat will begin to turn if the rudder is put over, or it will swing more readily to port. This is a valuable feature when maneuvering in close quarters.

Thus it may be seen that for several reasons in a single-screw (right hand) boat has a tendency to swing to port and will turn shorter in that direction.

When backing a single-screw boat steering is not at all certain except in a very few cases. There is no propeller race working on the rudder, and the relation of the propeller and

rudder and the stern of the boat is such that the boat will very likely back in the same direction which ever way the rudder is put over. The same conditions which cause a boat to work to port when going ahead are reversed when backing and tend to swing the stern to port. When backing the propeller action is much stronger than that of the rudder and the boat may swing to port against the rudder.

In order to know just how a boat will handle when backing it is necessary to try her out in unobstructed waters. In tide water the eddies are sometimes strong enough to exert a marked influence on the backing of a boat.

It is considered good practice to so maneuver that the backing will always be to port and to make all landings against the tide. As the propeller race acts on the rudder before the boat goes ahead, have the motor turning at a fair speed as soon as the clutch is thrown in. This assures a positive swing if it is possible with the boat. After the boat has gained headway, steering is easier and the boat will follow the rudder more readily. The same is true whether going ahead or astern.

The fact that the working face of the propeller blades do not function when backing also has some influence on steering. The back of the blades must propel the boat and being convex to give the required strength do not take the same hold on the water.

Knowing the cause of a boat working off its course and not backing with the rudder, and having tried out the boat, it should be possible to back in and out of a slip and make landings without getting into difficulties.

W. B. M., Newburgh, N. Y.

## Turn the Rudder as Little as Possible

THE action of the rudder and propeller in relation to the boat is rather a complicated question.

A very noticeable effect of the rudder upon the propeller is the slowing down of the boat when the helm is hard over, when going ahead, due to the resistance of the hull and action of the water. For speed, therefore, a point to be remembered is to maintain as straight a course as possible. A single-screw boat equipped with a right hand propeller will show a decided tendency to go to port with little or no action of the rudder. The opposite applies to a left hand installation. In maneuvering, the helmsman should take this into consideration. The quick-turning possibilities of a boat on the ahead motion are dependent upon many factors, among them the size and lines of the hull, the speed, the location and shape of the rudder (which should be, on the ordinary cruiser, as deep and as far aft as practicable) and the draft of the boat. It is almost a hopeless task to figure just how a certain boat will act. With the basic principles, as outlined above, the operator should experiment with his particular outfit and determine just what can be expected.

The results obtained when backing are more or less problematical. Many factors govern this. The writer had a medium sized cruiser, with a rudder of dimensions recommended by the builder, which invariably turned to port with the engine reversed, regardless of the position of the rudder, which was installed outboard, with about 6 inches clearance between the end of the rudder and the propeller. After considerable experimenting an inboard rudder with an increased depth of 8 inches was installed, and the propeller shaft was shortened about 6 inches, bringing the wheel closer to the deadwood. This had a decidedly good effect upon steering astern, and in ordinary weather it was possible, with the motor at half speed, to steer the boat equally well to either port or starboard. Trouble is experienced with many boats due to the unreliability of the rudder's good effect on the course astern. No particular remedy can be applied generally. The conditions present must be analyzed and met. Correction of the fault may involve a new rudder of greater depth, or a change in the stern construction of the boat, or of the depth of the keel.

J. W. K., Jersey City, N. J.

## Rudders Not Efficient When Backing

WHEN backing a boat, the propeller, of course, receives its action tending to suck water from astern and to drive it in a jet or column toward the boat. In doing so it loses much of its efficiency.

This loss is due to several causes, of which may be mentioned, first, that it is working in

dead, or quiet, water instead of that which is actually moving in the direction of the boat, giving an augmented thrust as is frequently the case in well-designed boats; second, it wastes a good deal of energy in driving the water against the boat which it thus retards; third, it works in disturbed water when the rudder is hard over, the free flow of the water being blocked by the rudder.

## Motor Boating's Practical Handbooks

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See page 52

A rudder, in turning a boat, pushes or pulls, depending upon the direction in which the boat is moving and thus forces the stern around. The amount of this push or pull depends upon the size and shape of the rudder, its location, and the force which is acting upon it. The last mentioned only concerns us in this instance, and this depends upon the velocity with which the water strikes the rudder, or, rather, to put it another way, the velocity with which the rudder moves through the water. Under the conditions of reduced speed when going astern, the rudder will be less effective and must be given a greater inclination to produce the same result.

In a single-screw craft there occurs another action which improves steering while going ahead, and this results from the fact that the propeller pushes back a column of water which moves back about ten per cent. (sometimes more) than the boat moves ahead, and which, therefore, impinges upon the rudder with that

much more velocity and, consequently, force.

Fig. 1 is a diagram showing the action of the rudder and this column of water when going ahead on the dotted line and dotted arrows, showing the probable effect of the rudder upon this column and the augmentation of effort thereby secured.

Fig. 2 is the reverse condition. Here the column of water is dispersed by the hull and the rudder itself is moving through water disturbed by the suction of the propeller or, in any event, dead and moving at a much lower velocity than when the craft is moving ahead.

When reversing, therefore, it will be necessary to turn the rudder through a greater angle than when going ahead, in order to secure the same result, and this will hold good for all the angles through which the rudder is usually turned. When coming hard over, however, the rudder may obstruct the flow of water to the propeller to such an extent as to interfere greatly and it may then have practically no effect.

The amount of helm necessary for given results cannot be described, it depends entirely on the boat and must be ascertained by experiment.

When going ahead, to secure the same change in direction, it will be necessary to give more helm when going slowly than when at a higher speed, but the amount, again, must be found by experiment.

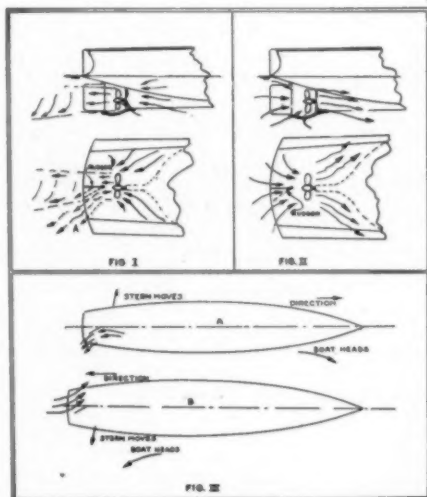
In any boat there is a certain minimum speed below which the boat will not steer at all. In other words, a boat must go at a certain speed, depending upon her size, length, form, size of rudder, as well as certain other factors, before she has steerage way. The critical speed which is necessary for a craft, in order that she may have steerage way, must be ascertained by trial.

In general, assuming that the same deadwood and cutaway under the forefoot and a hull of much the same shape, a single-screw vessel will turn more readily than a twin-screw craft, but as one can usually remove more of the deadwood from a twin-screw boat this difference can be neutralized.

The direction of turning, as a glance at Fig. 3 will show, is the same as that of the rudder, that is the boat will point toward the same side to which the rudder is swung or to the opposite of the tiller, if she be fitted with one, and this is true whether going ahead or astern.

In recapitulation, therefore, it will be seen that the rudder must be turned to the side toward which the boat is to go, and that when going ahead slowly it must be turned more than when moving fast and that the same holds true when backing, except that there must be more angle than when going ahead, but that the proper amount through which the rudder must be turned to give a desired effect, cannot be described but must be found by trial, as it varies with each boat and under different conditions of wind and sea with the same boat.

A. B., Scarsdale, N. Y.



A. B.—How the water acts on the propeller and rudder when going ahead and astern

## To Protect the Clothing From Sticky Varnish

THE wooden backed chairs used in many moving picture theaters, soda fountains, and restaurants are often a source of discomfort to patrons owing to their clothing sticking to the varnished surface, especially during the hot summer months. Many owners of such places realize this fact and equip their chair backs with slip-on cloth covers for the protection of customers from this annoyance.

Cloth slip-ons, however, are an expensive proposition. Three sets are absolutely necessary if they are to be kept fresh and clean looking. They must be changed at least every other day and the laundry expense soon mounts to a considerable item. Further, cloth is not the right material for the purpose because it absorbs perspiration, dust and grease, soils

easily, and wears out quickly owing to its frequent visits to the laundry.

An ideal material for these chair covers is a medium weight pyroxylin coated fabrikoid, which is dust-, grease-, stain-, and perspiration-proof, immune to germ bacteria, absolutely sanitary and as cleanable as glass. The cost of the fabrikoid is little more than a good grade of cloth. Only one set of covers is needed at a time and they will outwear a dozen sets of cloth. There is no laundry expense connected with fabrikoid as a little soap and water applied with a cloth removes all marks and impurities from its surface and restores its original lustre immediately.

Leather substitutes of this type have long been used for seat upholstery in many of the

legitimate, vaudeville and moving picture theaters, where it has proven vastly superior to leather in wear service, permanent attractiveness, and in cleanable and sanitary qualities. Another characteristic of fabrikoid which fits in admirably for theater use is that it is not affected by perspiration, which in the overheated atmosphere of the playhouse causes leather to disintegrate, rot, and crack.

Whether as a slip-on cover or as seat upholstery, proprietors of the places mentioned and the owners of automobiles and boats would do well to investigate the possibilities of fabrikoid, which offers them relief from the high price of both cloth and leather and provides a better, longer wearing and more satisfactory material.

# Motor Boating the World Over

**W**RITES Dr. E. L. H. McGinnis: "Many thanks to you for your kind note and the enclosed clipping of Chaperone II; I am indeed sorry you are out of those back numbers, as one grows more and more attached to her as time goes on.

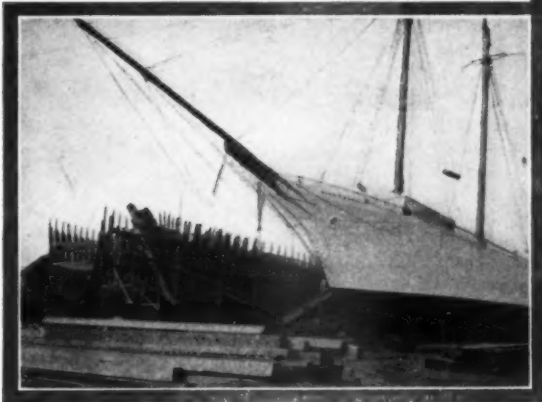
As it would never do to have a vacant place at my dock, I got Mr. Ford to find me an excellent Seabright dory, and by building a good cabin on her, I have the comfort of my life. Her one-lunger could be heard a mile away, as she wheezed down Peconic Bay, so I called

her Asthma. A good two-cylinder mill stopped that, and she is now a marvel of contentment as she tows her tender, Floating Kidney, and makes a speed of

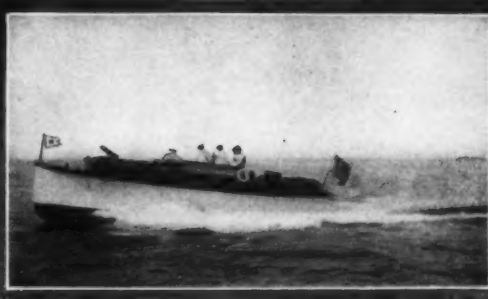


*The private landing at the summer home of Dr. E. L. H. McGinnis of New York City*

"Salome seemed to take the fancy of my friend, Thomas J. Falls, and she now flies the commodore's flag of the Milford Yacht Club.



*The type of ships now building at many New England seaports. It is such vessels as these that will soon be carrying the coastwise trade of this country*



*Ricochet, a Hand V-bottom express cruiser owned by M. S. Cornell, of Middletown, Conn., which holds the speed record on the Connecticut River*



*Bow view of one coaster in a New England yard*

better than eight miles; Measles and Nosebleed have been sold, and the gentle Water Wagon and Sassy Tomcat still serve the boss when asked to."



*U. S. S. Gopher, U. S. N. R., formerly owned by and now commanded by Lieut. W. M. Derby, Jr.*



*Half Moon, the auxiliary schooner owned by the Hon. Franklin D. Roosevelt, Assistant Secretary of the Navy, who believes in yachting during the war*



You can't kill the boating spirit even in the wheat fields of the Northwest. In their spare moments the farmers build boats and then tow them for miles overland to the nearest river for a few weeks' recreation afloat

## Echo III

### A 30-Foot Day Cruiser of Delaware Bay

**D**OWN on Delaware Bay they have some fast boats but there are a few that have as much real comfort and speed as Echo III a 30-footer owned by W. Beadenkoff, of Wilmington, Del. This little day cruiser was designed by Wm. H. Hand, Jr., of New Bedford, Mass., and has a beam of 8 feet and a draft of 2 feet, 6 inches.

The power plant is a four-cylinder  $5\frac{1}{2}$  x 6-inch Van Blerck motor equipped with complete electric starting and lighting system. This motor normally operates at 1,100 r.p.m., and turns a 21-inch diameter by 22-inch pitch three-bladed Columbian Ailsa-Craig propeller.

It is the method of installing the motor and



*The roomy and comfortable cockpit of Echo III showing the housing over the motor and all gauges mounted on a panel in the bulkhead*



*The motor is installed with only the flywheel in the cabin. Removable hatches in the cockpit floor give access to the lower part of the engine*

Photographs by Joseph N. Pierce

controls that give this craft more room than is generally found on a boat of this size and speed. The motor is located just aft of the bulkhead with only the flywheel in the cabin. The upper part of the cylinders and the manifolds are above the level of the deck and are enclosed in an asbestos-lined box that is easily removable. A section of the cockpit floor each side of the motor can be removed, giving access to the lower part of the engine.

The controls, gauges, switches and other instruments are mounted on a panel recessed into the bulkhead just above the box covering the motor where they are always within sight, yet not in the way or liable to be damaged. This arrangement makes it possible for the operator to have complete control of the motor and its accessories without leaving the wheel. As Echo III is used as a day cruiser the cabin is small and not elaborately equipped. It is only intended as a shelter in bad weather. The cockpit is of good length and when the removable canopy is in place affords a most comfortable place to enjoy an afternoon afloat.



*When running at full speed the bow raises and the boat planes on the flat after sections of the underbody*

# Keep the Wheels Turning

Some of the Novel Methods  
of Present Day Transportation

By L. M. Edholm

**W**ITHOUT any thought of benefit to himself a Southern California rancher devised a shade for his horse to protect it from the heat of summer. Yet the shade was so efficient that the horse trotted along as if it were springtime and accomplished more work than the other animals around, thus bringing reward in the way of steady work.

The device is made of light metal frame, attached to the shafts by four tubes and is easily detachable. A covering of oil cloth completes the inexpensive but very effective awning. Fringe is added to discourage the flies. This shade extends from the head to the flanks, thus protecting the entire body.

**A** NEW system of mail delivery has been inaugurated in a large plant in Pittsburgh. A small electric truck has been converted into a mail wagon with sorting table, pigeon-holes for letters, and a receptacle for packages. Even with this rapid delivery it takes one hour to make the rounds of the factory.

There are eighty pigeon-holes arranged on either side of the truck, the letter compartments



Photograph by Brown & Dawson

The narrow gauge railways of the British Army are as useful for transporting the wounded as the ammunition

measure  $3\frac{1}{2}$  inches wide, 10 inches high, and 12 inches deep and are labeled with tags which can be changed, as changes are made in the plant. Mail collections are made at the same time. Small parcel post packages are taken care of and a great deal of the messenger service in the plant is looked after in this way. About fifty per cent saving in time is gained by this system than by any other method tried.

**A**N enterprising young merchant in a small town decided that if he brought his goods to the homes of the farmers he would be more successful; instead of waiting until the farmer came to him or until he was going to a larger town for supplies. The result of his first few weeks of this service proved to him that he had hit upon a pretty good idea.

He had a large box body made for his little Ford, on the inside of this he had shelves arranged so that he could see at a glance his different styles of shoes. To this he added hosiery, shoe laces, and such things that go with this trade.

His store rent was the up-keep of his auto which amounted to very little, as he made arrangements with a wholesale shoe store to hold his goods for him until he needed them.



We have long had tops on our buggies, surreys, and automobiles, but it remained for a Californian to put a sun shade over his horse

The value of an automobile as a merchandising medium was quickly proved by an enterprising merchant in a farming district. He no longer waits for the farmer to come to town to make his purchases, he goes to the farmer's home



Speed is now the watchword in all lines of business. Office boys and messengers on roller skates are a common sight but one factory has gone a step further, they have an electric truck to carry the mail



# Feeding France

## Substitute Flour and Farina Made From Potatoes

**N**CESSITY is of course the mother of invention, as the war is daily proving to us. No one imagined a few years ago the possibilities of manufacturing food products from cast-away material. Great ingenuity is shown today in finding these food substitutes and organizing the work of production. The immense food resources of the United States have not rendered it necessary as yet to practice these economies, but in France they are the subjects of anxious attention.

French scientists have discovered that an excellent substitute for flour may be manufactured from vegetable parings. An enormous amount of such material has gone to waste in the past without anyone realizing the loss. No matter how carefully a potato may be pared, a considerable part of the edible part is usually thrown away. It has been

The machinery devised for this purpose is a model of efficiency and saves all unnecessary hand labor. The material is shoveled by the ton into a trough containing water, arranged on a slight incline. A series of metal arms slowly revolve through this, washing it and

machine automatically does the rest.

The pulp-like material is gathered in baskets as it comes from the rolls of the grinding machine and is mixed with water. The mixture is then run through screening apparatus which catches all the pulp but lets the water escape.



*As the vegetable pulp comes from the grinding machine it is mixed with water and put through revolving screens*



*In this machine the potatoes or other vegetables are passed between grinding rolls and reduced to a pulp. This pulp is collected in baskets and is ready for screening and drying*



*The potatoes from which the flour is made are shoveled into a trough of water where they are washed by a mechanical agitator before grinding into pulp*

Photographs by Williams Service

found by analysis that enough nutrition to supply a family is thus literally thrown away by a cook almost daily.

A substitute flour and farina may be extracted from this hitherto waste product. The potatoes or their peelings and other vegetables are first ground by machinery to a fine pulp,

carrying it slowly forward to the conveyor which feeds the grinding machine. A series of iron baskets fixed to an endless chain pass through the mass and, scooping it up, raise it to the level of the grinding machines. One or two workmen armed with pitchforks shovel the material into the washing trough and the

As shown in the illustration, this screening device is made up of a metal frame to which are bolted eight frames covered with a material having a very fine mesh forming an octagonal revolving screen. The mixture of vegetable pulp and water is fed into the screens through the pipes, the pulp being collected inside while the water escapes to the tank underneath.

The vegetable pulp recovered on the screens is dried and ground into flour. This flour has a comparatively high nutritive value and makes a cheap and wholesome substitute for the wheat or rye product. Naturally some of the finer pulp and a great deal of starch passes through the screen along with the water.

This water is collected and treated by a process which makes it possible to recover the starch and use it for laundry purposes or it is converted into a form of farina.

As potatoes contain an average of about twenty per cent. starch the water is rich in this valuable product and the recovery is very simple. The starchy water is slowly fed to a sloping table from 60 to 120 feet long and having a fall of only 3 or 4 inches. The starch settles on the table while the vegetable matter or pulp is carried along by the water.

The starch gathered from the tables still contains dirt and sand. To remove these it is stirred up with water in large wooden tanks. Being heavier than starch, the sand and dirt settle rapidly to the bottom. As soon as the stirring process is stopped the starch begins to settle and is drawn off through holes in the side of the tanks. This process of stirring in water and settling is repeated several times.

## Motoring Comforts

Several New Devices to Lighten the Work and Increase the Pleasures of Touring



Using the new emergency oil container



Left: Those who know tell us it makes some difference in the feeling of your throttle foot at the end of a long drive if you have a foot rest that is right. Here is one said to rest and make it possible to avoid the jerky feeding of gas which is wearing on your engine. The foot does not get tired on long drives; up hill and down, over rough roads and smooth. The foot rest is adjustable to any position, and does away with the scarring of the floor boards

MANY features for the motorist have made their appearance in the past but it is doubtful if any of these is more unique and practical than is the novel exhaust stove shown in one of the illustrations. This affair is just what its name implies, a feature which takes the heat from the exhaust of the auto which is generally wasted and makes it cook everything and anything that is needed for the camp meal. It may be used for baking potatoes, beans, apples, etc., for heating all kinds of canned goods, as well as for making coffee or boiling water for tea, and the like. If the motorist hits out into the hills and catches a nice mess of trout, or bags a rabbit, he may, before starting home, prepare these for cooking and place them in the exhaust oven. When he arrives home he lifts the lid of the stove and finds that the eatables within have been cooked "to a turn" and are ready to be placed on the dining room table. Potatoes and apples may be cooked while the car is covering a distance of about twenty miles, while the fish or rabbit may be well cooked in a distance of from fifty to sixty miles.

The remarkable part about this stove is that this cooking process takes place while the machine is rolling along at a rate of 30 miles an hour. While traveling overland the tourist may, at a certain time before each meal, place whatever he wants for the repast within the exhaust stove, put on the lid and continue on his way. Upon stopping for lunch and when everything is ready, the stove is opened and the hot meal is taken from the oven, ready to serve, and all without a penny of expense to the motorist.

When it is closed this stove looks like a regular steel tool case, located upon the runningboard of the car. It is about 2 feet in length, 10 inches wide and 12 inches in height. Within this steel case is a sheet-iron case, so arranged as to leave a heating compartment of one inch around each of the sides and ends

and across the bottom. In the side of the main exhaust pipe, directly behind the stove, a hole has been cut (just as it would be for an ordinary muffler cut-out) and over this the inner end of the pipe leading to the stove has been clamped.

From the main exhaust pipe the burned gases pass through the connecting pipe and into the forward end of the exhaust stove, after which they circulate around all parts of the heating compartment, emerging from the rear end of the stove and out through an independent exhaust pipe, which runs parallel to the main exhaust. Located between the main exhaust pipe and the stove is a valve which may be opened wide when the food is to be cooked, or partially closed when it is desired simply to keep the various things within the stove warm. Instead of serving in any way to overheat the engine, this stove really acts as a cooling agency, for it relieves the engine of much of the back-pressure caused by the muffling operation of the muffler. On the other hand the back-pressure caused by the muffler serves to force enough of the heated gases through this stove to insure its satisfactory operation. The heat is held within the stove by the thick sheet of asbestos located within the lid.

Several fixtures have been provided which fit snugly within this stove. For baking potatoes, etc., a pan, similar to a regular bread baking tin, is used, while for warming up canned goods there is an especially-made wire netting. For boiling water or making coffee a particularly designed can is pressed into service.



A fireless cooker for the motorist that will cook his meals "en route"

TO appreciate this new accessory it is only necessary to have your car stalled once, miles from the nearest supply station, the engine smoking like a Pittsburg chimney, and not a drop of oil in the crankcase. Perhaps you never carried an emergency oil supply, the cans are always oily and catch all the dust and dirt. This new container is oil-tight and perfectly clean. To open it the cap is removed from the sharp end and with a pocket knife the cone end is cut away. The oil is then poured from the cone into the base of the motor without so much as a drop of oil getting upon the hands or clothing of the operator. After the oil has been removed the cone may be thrown away or the bottom may be cut out, whereupon it serves satisfactorily as a funnel.

This cone is made entirely of paper. It is 10 inches in height and 5 inches in diameter at the base. Each one holds a quart of oil and very convenient cases or cartons have been arranged which hold four cones each. This gallon carton may be placed within the tool box or beneath the seat of the car.

Running a tractor is so similar to driving an automobile that the farmers' wives can do as much work plowing as two hired men and three teams of horses



It is not only for hauling that the tractor is useful. It will run the threshing machine, corn husker, ensilage cutter, wood saw, and other farm machinery



Photograph by J. R. Schmidt

## Tractoritis

A New Epidemic That Is Spreading Rapidly in the West

THE answer of Ohio farmers to the nation's cry for food sounds like a pop-gun and smells like a flivver. That's how a tractor impresses you. In Ohio these days an inactive tractor would be arrested for giving aid and comfort to the enemy. Maybe you have never seen a tractor like this stalking down a stubble-field and leaving a couple of neatly plowed rows in its trail, and doing the job about three times as fast as a team of horses.

You learn that it takes a liberal portion of gasoline mixed with air to operate it; whereupon you want to know if it isn't more costly to plow by tractor than by horses, gasoline being pretty high these days.

You might have known you were wrong, of course, because if that were true, the farmers of Ohio would not be replacing horses with tractors.

Within a radius of a few miles of Lewisburg, O., there are twenty-nine tractors at work today. The demand for tractors in Preble County is far greater than the supply, that's why we came to Preble County to get the good word and pass it along so that the other folk can find in Preble

County's epidemic of "tractoritis" an inspiration for good citizenship and an example of good sound business.

Ohio is called the banner tractor state and Preble County is said to be the banner tractor county of the state.

But you observe here that tractors cost money and how does it happen that Preble County farmers are able to indulge themselves so much more extensively in tractors than their neighbors?

That is where Waldo C. Moore, cashier of the People's Bank of Lewisburg comes in. Moore was one of the first to see the possibilities of the modern miracle maker, alias the two-cylinder tractor. He had an idea that not every farmer would quickly raise the purchase price, so he said, "This is no time to wait, we'll get the money for 'em."

Any farmer in Preble County can buy a tractor by paying \$100 down and giving his note to the People's Bank for the balance.

The farmer can take as long as he needs to pay off the note. The experience of the bank has been, however, that the tractor "speeds up" farm work so much, thus increasing the profits, that a tractor can be paid for in one good season.

The first man to own a tractor in the county was Fred C. Coy, of Lewisburg. He bought his tractor in the spring of 1917. Everybody wanted to see how it

(Continued on page 78)



A type of tractor that is replacing horses in the United States Army as a means of transporting field artillery

# Spaghetti a la Americaine

## Quantity Production Methods Applied to the Favorite Italian Dish

A SERIES of very complicated, high-powered machines are required to turn out the delicate threads of macaroni for the daily table. The massive cylinders and supports found in these factories appear to be designed for handling iron or steel rather than dough. It is only by exerting hundreds of horsepower that the macaroni is made light and palatable. The complicated arrangement of machinery looks strangely out of place in a kitchen. A great part of the macaroni of commerce is made by much more primitive methods, but the modern machinery employed in America is said to produce a finer grade of macaroni, besides making quantity production possible.

The work of hundreds of men is done far more quickly and cheaply by the use of this modern machinery. It is obviously easier to keep a single machine clean than hundreds of human hands. The somewhat complicated process is carried out now almost without the touch of a hand. The first process consists in preparing the dough. Flour made from a fine grade of hard Canadian wheat is used. The flour is poured directly into a large mixing machine, water is added, and a series of forks

macaroni its familiar forms suggests some powerful hydraulic punch for working heavy pieces of steel. A great lump of the dough is placed in one of the cylinders and a piston is driven down on it with great force. An enormous pressure is required to force the dough through the openings in a plate or die beneath, which give it the familiar form. The dough used for making macaroni is very stiff and the holes in the die are comparatively small. Any housekeeper will realize that a great pressure is required to force the dough into shape.

A variety of dies are used for giving the dough any desired form. The same dough is used in every case, but by varying the size and shape of the hole the size and appearance of the macaroni is readily controlled. The familiar hollow stem macaroni is formed by forcing the dough through openings with plugs in the center. A great deal more force is naturally required in punching this form than the solid strands. An accompanying photograph shows the surprising variety of dies used in the work. These dies are made of steel,

*In manufacturing elbow macaroni the dough is cut into short lengths as it comes from the die*



Photographs by Publishers Photo Service

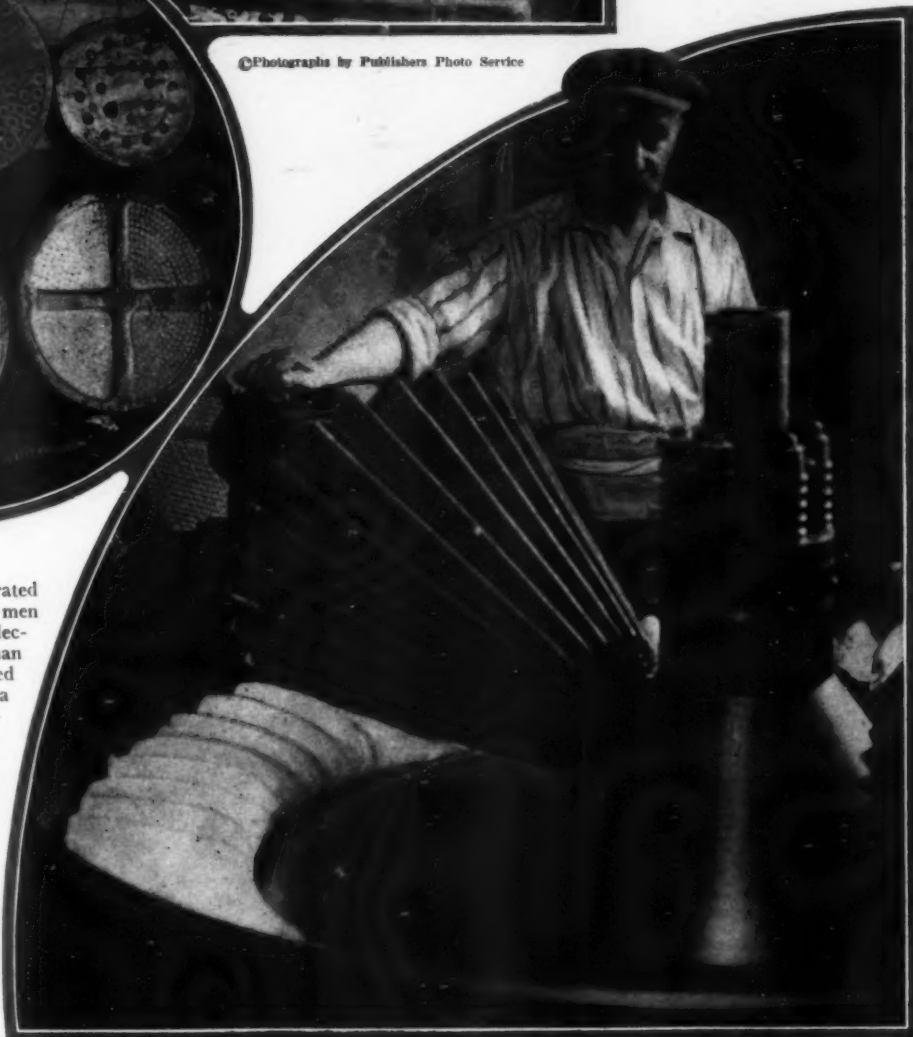


*The steel dies through which the dough is forced to form the strings of macaroni*

are set in motion. The machine is operated by electricity, and the work of scores of men is performed by turning a switch. The electric mixer is much more satisfactory than the hand work of the most experienced bakers. The dough thus prepared is of a much more equal consistency besides being cleaner.

After this thorough mixing the dough is poured into a powerful kneading machine. The bowl of this contrivance is about 5 feet in diameter and more than 1-foot deep, so that it holds a large quantity of dough. The kneading is done by two corrugated metal cones, which revolve about the bowl, giving the dough just the proper push and pull to render it light. A hundred bakers could not do the work so thoroughly. A single workman presides over this giant batch of dough. The accompanying illustration shows the powerful mechanism and the smooth ring of dough beneath the rollers.

The machine used for giving the



*Dough for macaroni must be much stiffer than for bread and requires powerful machinery for kneading it and working it into proper condition for the hydraulic presses*

and must be replaced from time to time, since the openings are worn away when the macaroni will appear less uniform. The macaroni is forced from the machine in the form of scores of separate strands. A workman standing below the disk gathers up these strands and cuts them off to any desired length. The soft strands of dough are then hung over poles on a cart and carried away to be dried.

Still another machine is used to make the familiar elbow macaroni. The strands in this case are hollow. As they emerge from the disk or perforated plate, they come against a revolving knife which cuts them off into the desired lengths and gives them a twist. On drying they harden into this form, and keep this shape later when they are cooked and served. A very costly machine is required to give the macaroni this slight turn which gives it a particular value. The elbow macaroni cannot, of course, be hung up to dry and is set in shallow trays with bottoms of wire netting which permits the air to circulate about them.

As with bread and all forms of cereal today, macaroni is made on a war basis. The so-called war macaroni is made of seventy-five per cent. flour and twenty-five per cent. of some substitute. The strands thus prepared are said to have the same nutritive value as those made entirely of flour. An interesting test was made recently in New York, when a jury of Italians, who qualified as experts on macaroni, were invited to eat samples of macaroni made entirely of wheat as



*The plunger of the hydraulic press forces the dough through the die plate, forming strings of macaroni or spaghetti*



*The flour is mixed with a minimum of water making a very dry, stiff dough*

well as the war product. Both kinds of macaroni were skillfully cooked, the jury was unable to distinguish between the two and the verdict was unanimous.

The same dough machines that are used in the manufacture of macaroni are used for spaghetti and vermicelli. The only change necessary being the die plate which forms the strings. For macaroni the die plate has a small mandrel in the center of each hole to give it the tubular form while for spaghetti and vermicelli the die has small round holes. As shown in the illustration the holes in some of the dies are so close together that the effect produced is that of a screen through which the dough is forced by the hydraulic press.

## Dynamite—A Substitute for Labor

**G**REAT as is the need for men to fight the forces of evil in foreign fields, equally as great is the need for men to man the plows, harrows, and reapers.

No longer is there a type of man on the farms that in any way approach those early settlers who migrated westward and hewed a home from the forest, and no longer is there a type of man who is willing to work as a farm hand, and by apprenticeship learn the business of farming by economy, thrift, and hard work.

The tractor has replaced the horse, improved mechanical tools have taken the place of hand labor and rough stumpy ground thickly imbedded with boulders, and in many places covered with water, has given place to smooth, dry land by the use of a little dynamite, making the farm much easier to work.

Do not blame a man who does not want to plow, when for every 20 feet he plows, a hidden boulder or soil covered stump suddenly

stops short his progress. Nor is it pleasant to have to wade through swampy or marshy ground occurring in spots between the dry sections. By the judicious use of dynamite these impediments to productive progress can be eliminated. Dynamite is America's substitute for labor.

Millionaires and philanthropists have been wont, in times past, to expend their millions for the building of libraries and institutions of learning. A better use of that money can be made by expending it to help meet the problems of production. One of the greatest sources of waste in this country at present is the land that is under water, in some cases but a few inches. There are millions of acres of idle land that need but a little draining to become the most fertile of productive land.

There could be no greater undertaking in America today than for men to clear farms of water, stumps, and rocks, build homes and stock farms, and offer them upon small pay-

ments to those who could prove themselves capable and worthy.

By adopting the use of dynamite for ditching swamps, the farmers of the United States can immediately drain their low, wet lands and make use of their stored fertility in producing heavy crops of corn and other grains to help supply the unprecedented demand for wheat substitutes, and if we increase the acreage of land planted, and if our harvests are normal, we can thereby enlarge the surplus for export through increased production.

The same method of ditching farmlands with dynamite can also be profitably employed to drain the mosquito breeding swamps and meadows. In many instances the ground is so saturated that it yields under the slightest pressure, this making it impossible to employ ditching machines, and unless the meadows border on navigable waters the cost of bringing a floating dredge to the scene of operation is prohibitive.

# Breaking the Office Routine

Some New Devices Applied  
to Old Operations



*An electric wax melter for banks, express companies or other concerns having a large number of packages to be sealed*

FOR banks, express companies, and other places where the sealing of packages with wax is a necessity, the electric wax melter and sealer is doing such work safely, simply, and with much more speed than older methods. The device works with a cup-like arrangement into which the wax is placed. In the bottom of the cup is a valve which permits the melted sealing material to drop down upon the location to be sealed. The amount of wax is under the control of the operator by the valve rod. Heating of the wax takes place as it is being used, and only enough wax is actually heated for the jobs on hand. A heating head is screwed tightly onto the wax cup and the handle of the machine then screwed onto the heating head. The machine itself with proper care works perfectly, but an operator has to know the job, and the care of the machine, as the least bit of paper, lint, chips, or dirt that gets into the melter may cause trouble. Branding of tools or other material is being done successfully with an electric branding iron made by the same people who produced the electric wax melter, soldering irons, etc.

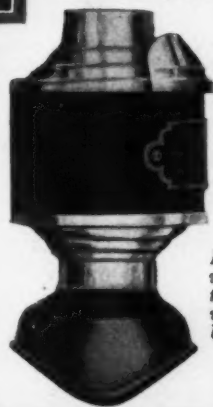
WHEN it is desired to trace a sketch or drawing from a book or catalog page it is often difficult to hold the tracing cloth or paper in place. Tearing the leaf out of the book spoils it for future reference and is a bad practice anyway.

Sometimes the page can be tacked down on the edge of a drawing board, but a much simpler way is to get a can of pure rubber cement, such as is used to put patches on automobile tires. Smear some of this cement around the margin of the page, let it dry until it is tacky, then lay the tracing cloth or paper over the page and press it down into the cement. This will hold the tracing firmly in place.

When the drawing has been completed it is easily removed from the page by raising one corner and carefully pulling the two apart. The cement that adheres to the drawing and page is removed by rubbing the fingers over the cement. This will cause it to peel off the paper in little rolls without leaving a stain or spoiling the surface. Pure rubber cement can be used as an adhesive on almost any material without injury.



*By the use of this device it is possible to talk into a telephone without being heard by other persons in the same room*



A RESIDENT of Pasadena, Cal., has devised and constructed a novel type of rack, the purpose of which is to keep the daily newspaper clean and dry, regardless of the condition of the weather. This feature is shown in one of the accompanying illustrations. The rack consists of an iron upright or standard, (this one being made of gas pipe), a curved sheet-iron top or roof, which serves to protect the paper from the rain, and a pair of springs, extending downward from the underside of the roof, the purpose of this being to hold the paper or papers tightly against the post.

The method of operation of this feature is quite simple. The paper boy, as he passes along the street, pauses for a moment in front of the rack, takes a paper from his sack and forces it up with a single motion between the spring and the standard, and a moment later is again on his way. The pipe used in this feature is of 1-inch variety, while the roof is 12 inches wide and 19 inches in length. The entire feature has been finished with a coat of aluminum paint, which, in addition to preserving it, also adds to its attractiveness.



*A home-made device that saves the news boy many steps and protects the paper from the weather until taken in by the customer*

## American Made for American Maids

**T**HERE was a time, and not many years ago, either, when practically all the dolls in America were made in Europe. The most expensive and best dressed members of doll-dom came from France, while those from Dresden held almost as high a social position in their diminutive world.

Both the French and Dresden dolls were made of china or bisque and although they were beautifully colored and dressed and had real hair, the faces hardly resembled those of their small owners. Then, too, they were very fragile and made many trips to the doll hospitals in the course of their lives.

The toy makers of the Black Forest also sent out a host to join the Christmas throng, but these were of a cheaper and less elaborate variety. They, however, brought joy to many small hearts. Then there was the home-made rag doll, too, that has almost disappeared.

The dolls on the market today are nearly all of the non-breakable variety, or have only heads of bisque. These up-to-date dolls have faces that so closely resemble a child's that they seem almost about to move or speak.

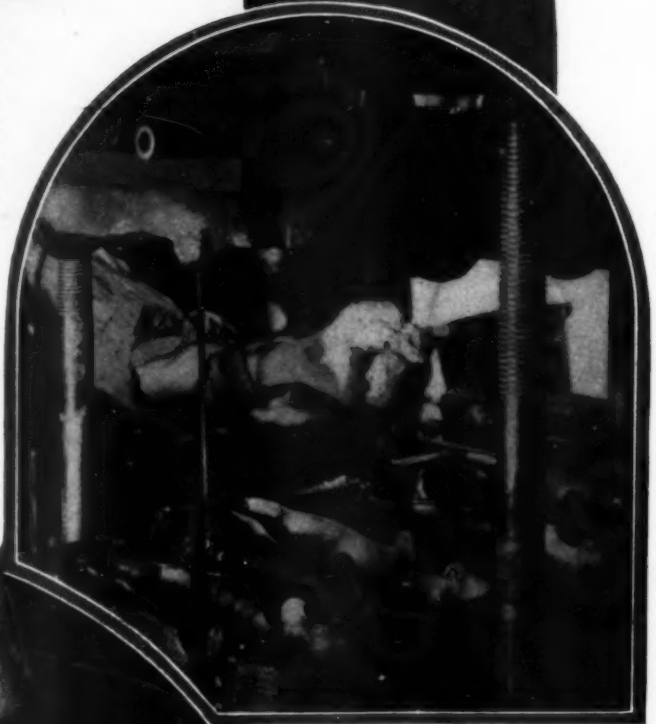
These indestructible dolls are made of wood pulp, baked under high pressure and painted true to life. The manufacture of these dolls has been put on a quantity basis typical of American industry.

A handful of the pulp is placed in each die on the bed of a hydraulic press, the press is then closed and the heated upper half of the die forms the hollow inner portion of the doll and bakes the pulp into a hard, tough shell. These shells are made in pairs, forming the front and back of the doll, and having interlocking lugs.

When removed from the press the two halves are glued together, forming the head and body. The arms and legs are made in the same manner. After the glue has become thoroughly dry the rough edges are removed and a coat of paint completes the process. To secure an even coating the paint is applied with an air brush.



*The completed dolls are first given a coat of flesh colored paint, then the operator paints the hair on their heads with an air brush. He also puts the rosy bloom on their cheeks with the same apparatus*



*The wood pulp which the workman is holding in his hand is spread evenly in the molds. The lower section is then brought up against the heated upper dies and under great pressure bakes the pulp into the desired form. These shells, as they are called, are made in two parts, front and back*



*As the shells come from the press the edges are dipped in glue and the front and back halves joined, to form the head and body of the doll. The interlocking lugs aid in holding the two halves together*

## Civilization Turned Backward

**J**ULIUS CÆSAR with his army crossed the Alps and captured Gaul. The roads, and even some of the stone bridges, built for Cæsar's army are still in use. After 2,000 years these same roads are again being used by a conquering army on its way north. For present day movements and transportation of supplies these historic roads are far inadequate.

To reach the points of vantage in the mountains the Italian army engineers have made use of an overhead cable road or teleferic system. They suspend a heavy steel cable between mountain peaks or from a valley to a mountain top and send their supplies forward slung to a car on the cable. No country is too rough for this method of transportation; in fact, it requires a mountainous country to be used with success.

Men, munitions, and food can be sent forward and the wounded returned to the base by this system as rapidly as by roads, could roads be built to these inaccessible places.

Compare with the constructive work of the

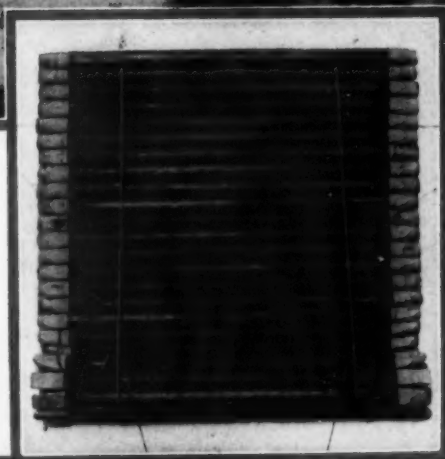
Italians in the Alps the barbaric methods, resurrected from the dark ages, employed by the Hun. Not satisfied with firearms they have resorted to the spiked club that was popular when knights wore armor and caltrops, the four-pointed iron stars that were once used to stop cavalry charges. Not being satisfied with strewing these stars over the ground, the Hun fastens them to boards, so close together that it is practically impossible to walk over them without becoming empaled on the spikes. These boards are laid in the trenches or even out in Nö-Man's Land. The illustration shows some of the caltrops in trenches recently captured on the Cham-paign front.

*Not satisfied with strewing the ground with caltrops in the approved manner of the Middle Ages the Huns fasten them to boards for use in their trenches*

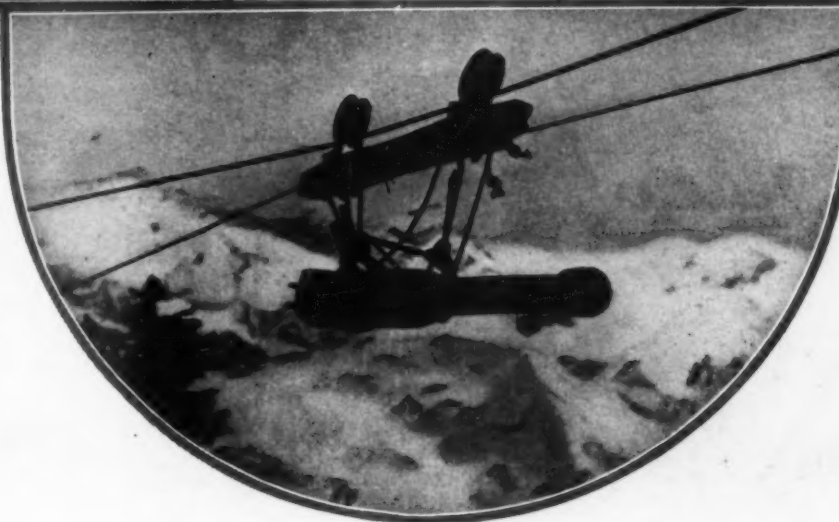


© Photographs by  
Kadel & Herbert

*The difficulties of transporting military supplies over impassable country has been solved by the Italian army with the teleferic system*



*Carrying the wounded on a stretcher through the trenches, especially in the zig zag communication trenches is not an easy job. The Germans have devised a stretcher chair for this purpose that is much easier to handle than the older style*



*A new device to save torpedoed ships that has recently been patented consists of a number of steel tubes with wedge-shaped wooden ends that rolls up similar to a bamboo awning. When used it is unrolled over the ship's side and held in place by the water*

## Artificial Arts

THE public has long been familiar with the plaster statuettes made and sold by Italian street venders. Of late a new process has been perfected by which statuettes are made of marble dust, producing an article which closely resembles a real hand-carved marble figure.

Both the texture of the surface and the weight of the object are the same as when cut from real marble. The process used is a carefully



© Photographs by Publishers Photo Service

*Artificial marble statuettes are now made so that they resemble the real article, both as to weight and texture of the surface*



guarded secret, but it can be stated that the marble dust is mixed with a binding material and brought to the boiling point and poured into the molds while still hot.

After cooling for several hours the molds are opened, the statuettes removed and finished by hand. The only work required is the removal of the mold marks and sandpapering the surface.

A LITTLE over ten years ago Louis Paris, a chemist and scientist startled the world with the announcement that he had discovered that for which so many had searched in vain—the secret of making synthetic gems. His announcement was supplemented with a display of artificially-made sapphires, which neither in appearance nor composition could be distinguished from the same gems made by nature.

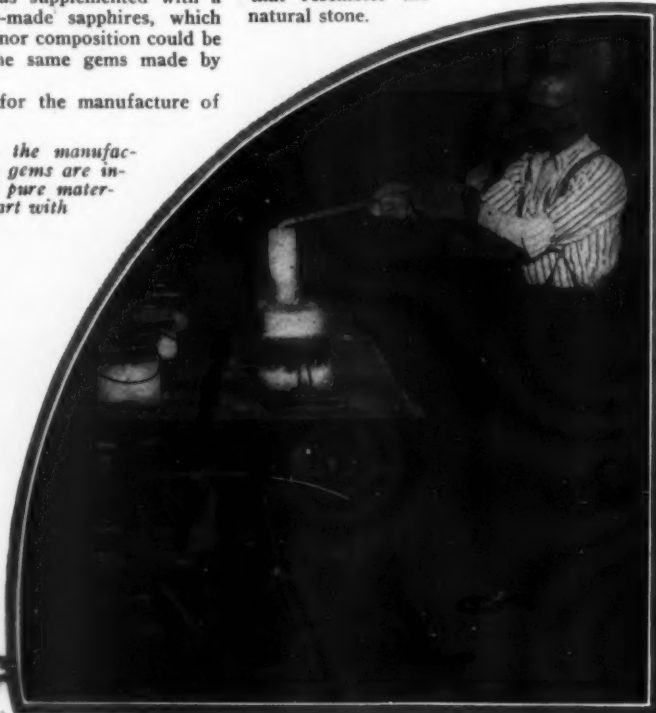
The raw material for the manufacture of

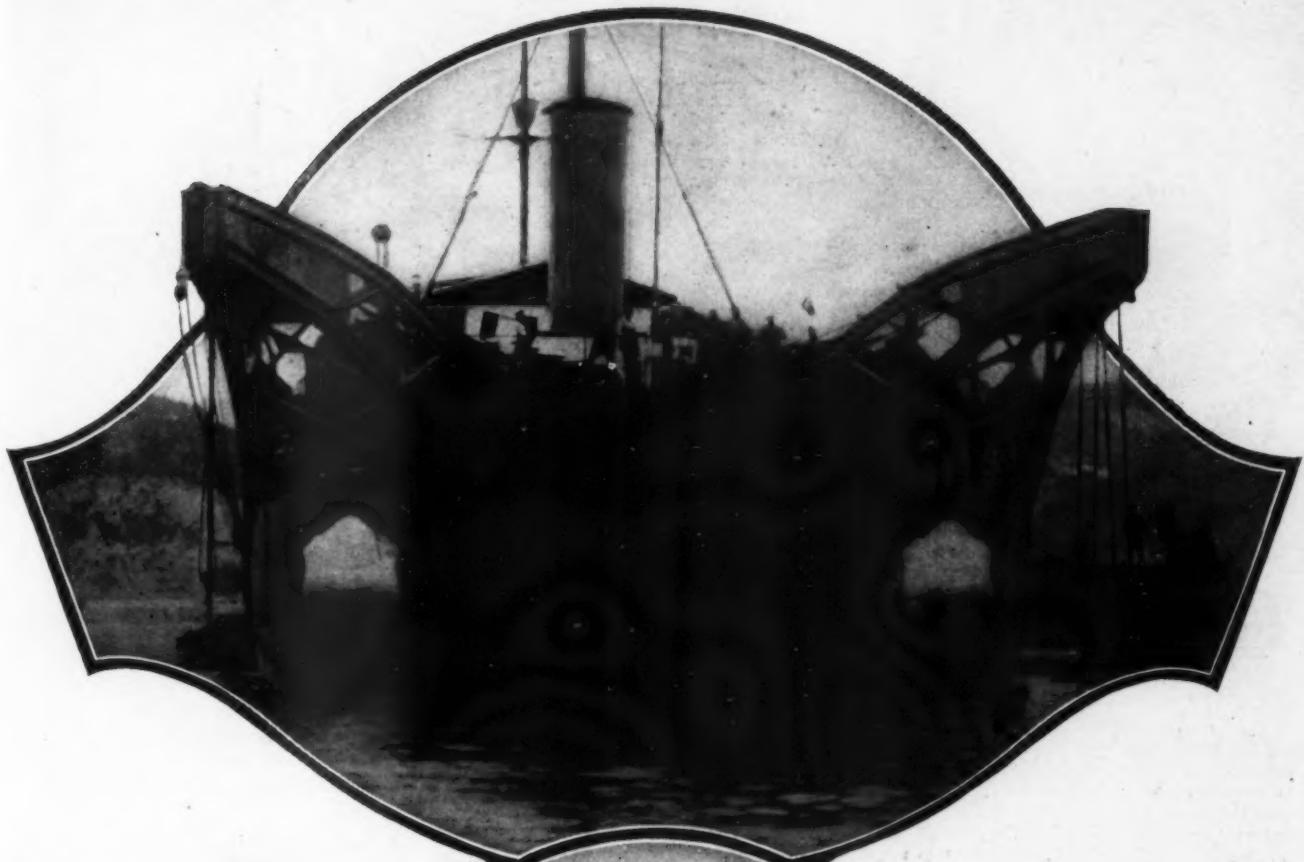
*Two essentials in the manufacture of synthetic gems are intense heat and pure materials to start with*

sapphires is silicate of alumina—common clay, such as bricks are made from. Every spade full of clay contains the latent possibilities of a hand full of sapphires, invisible and undeveloped.

Louis Paris' method of making synthetic sapphires is to mix some powdered aluminum with a little oxide of cobalt and put it in a furnace where it is heated to a temperature a little over 2,000 degrees Fahrenheit. The powder is then placed in small receptacles with funnel-shaped bottoms. These receptacles are placed over an oxyhydrogen blowpipe and agitated in such a way that as the powder falls from the funnel into the intense heat of the blowpipe flame it is fused and forms a molten sapphire.

The drop thus formed is a pure sapphire that resembles the natural stone.





## Salvaging

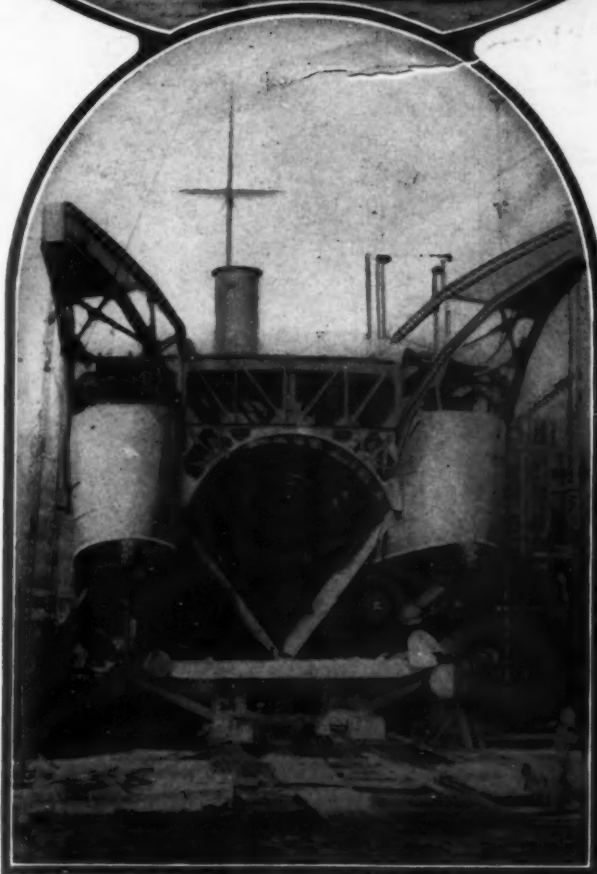
EVER since the sinking of the first iron ship, the problem of salvaging wrecks has been a subject of great interest to both owners and wreckers. With the smaller wrecks there is not much difficulty provided they do not lie in deep water. It is only necessary to pass several chains under the hull, lead the ends to pontoons or scows and gradually pull up the chains by means of levers and hydraulic jacks.

Whenever possible the cargo is first removed by the aid of divers, in order to lighten the load to be lifted. The hull is then either taken to a dry dock while yet supported by the pontoons or the damage is temporarily repaired, the water pumped out and the boat taken to a ship yard for permanent repairs.

Raising sunken vessels by means of pontoons is all right in protected waters, but when the outfit is exposed to ocean storms the whole plant may be lost. The next method used was to have divers stop up all openings in the hull, such as hatches, companionways, port holes, ventilators, and smoke stacks, and pump compressed air into the vessel.

At first thought it may be wondered what becomes of the air and water in the hull with all openings closed, but this problem is easily solved. As the air is pumped into the ship a corresponding volume of water is forced out through the rents in the bottom through which it entered. It is only a question of time when sufficient water has been forced out and the wreck will have sufficient buoyancy to come to the surface.

In carrying out this method with large ships it is customary to pump the air into each water-tight compartment separately and thus more closely control the buoyancy and cause the vessel to rise from the bottom with less chance of turning over or meeting with



*Stern view of mother ship for submarines recently completed for the Italian Navy*

other accidents that are liable to occur.

There is another method of raising sunken vessels that has come into use during the last few years that is quite simple. Large cylindrical steel tanks or pontoons are filled with water and sunk on either side of the wreck. Divers then make them fast to the hull or pass chains under it and secure the ends to the pontoons. Compressed air is then let into the pontoons forcing the water out

## Submarines

through openings provided for that purpose. As soon as the pontoons have sufficient buoyancy they rise to the surface bringing the wreck up with them.

The German navy has lost untold numbers of submarines with no way of even making an attempt to recover them. This is not the case with the Allies, however, and Italy has recently completed a most remarkable mother ship, or floating repair yard for submarines.

In the construction of this ship are combined all the necessary facilities for raising a sunken vessel.

The hull is divided into two portions, securely held together above the water by heavy steel trusses. These two portions of the hull are used in the same manner as scows or pontoons were formerly employed. With the heavy steel bracing and large deck it makes a much steadier working platform than could be secured by the older method.

Overhanging the stern are two heavy steel crane-like structures with powerful lifting tackle suspended from the outer ends. With these it is possible to raise a submarine from the bottom, should it be necessary, and get it into such a position that it can be raised up between the two portions of the hull.

Once in position in the tunnel-like space it is a simple matter to make minor permanent repairs or if the damage is severe, such temporary repairs as will enable the submarine to be taken to a regular ship yard.

Such a mother ship as this, carrying a crew of skilled workers, repair material, and spare parts is a most valuable addition to any submarine fleet. Stationed at a central point it can be quickly sent to any submarine that has been wrecked or sunk, and, with the facilities aboard, can raise the sunken vessel without delay.

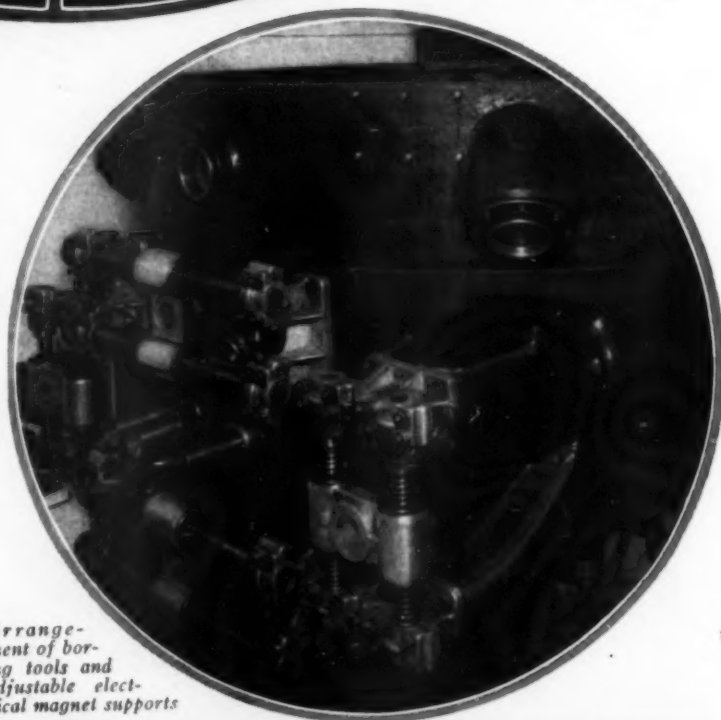
## The Cannon Ball Submarine



**M**ILLIONS and possibly billions of dollars' worth of treasures now lying on the ocean floor in sunken ships may be regained to the world by the cannon ball submarine invented by W. D. Sisson, an American engineer. The great diving bell has just been completed and is now being tested. It resembles a cannon ball, a giant sphere, 8 feet in diameter. The shell is made of tough vanadium steel  $1\frac{1}{4}$  inches in thickness and weighs, with the machinery inside, 6 tons. The submarine accomplishes its work by maneuvering huge steel pontoons alongside a sunken ship and belting the pontoons to the vessel and then releasing the mechanism which pumps the pontoons free of water and raises the sunken ship. The largest pontoons are 40 feet long and 15 feet in diameter and have a lifting power of 300 tons each.

Two operators form the crew of the diving bell and they work in normal atmospheric conditions maintained by an oxygen tank on top of the sphere. The air supply will last seventy-two hours without being replenished. The supporting cable and all electrical and telephone wires are carried in an insulated cable which is strong enough to support 56 tons.

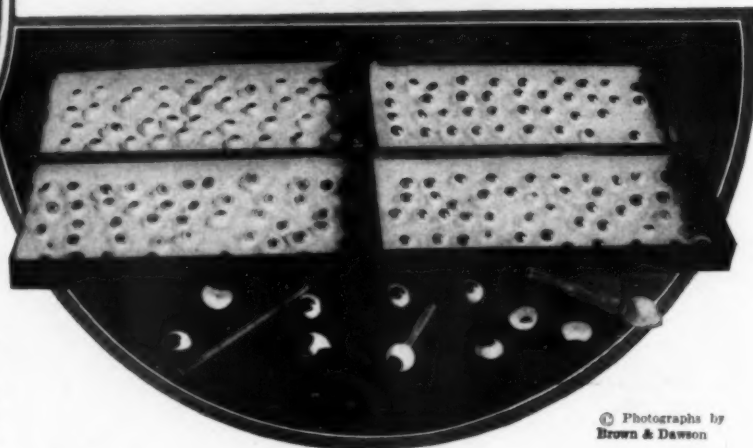
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Arrangement of boring tools and adjustable electrical magnet supports



Starting with a small piece of white glass fused onto the end of a glass tube, the glass blower carefully works it into the shape of the human eye. The colored glass to form the pupil and iris is then shaped on the end of another glass tube and fused onto the eyeball as shown in the illustration. The eye is finished by cutting away the glass



© Photographs by Brown & Dawson

## Science of the Month—Geology

**C**OSMICAL theories are born but once or twice in a century. Owing to their vastness, this is only to be expected. The older Laplacian, and the newer Planetesimal theories deal more truly with the nature and origin of the whole Cosmos; the "Tetrahedral," which we are to describe, deals wholly with our earth.

This theory arose out of the study of several curious facts known as "geographical homologies." They comprise the following:

First: There is known to be a great preponderance of land in the northern hemisphere, and of water in the southern.

Second: Most oceans and most continents are more or less triangular in shape. There is also the well-known dictum—that all peninsulars point south—Africa, South America, India, Florida, etc., being good examples of this. Yucatan and Denmark are the only important ones pointing north. This is a singular fact, needing explanation.

Third: The lands of the northern hemisphere form an almost unbroken ring, just as the oceans form an unbroken ring of water in the southern hemisphere. Greenland was originally joined to Scotland, as we now know, so that this was even truer in prehistoric times than it is now.

Fourth: The significance of the fourth homology has only lately been understood. It is that land and water, on the globe, are nearly always "antipodal," that is, one may be reasonably sure that if one places his finger on land anywhere on the earth's surface, water will be on the other (antipodal) side, and vice versa. By projecting the southern hemisphere onto the northern, it will be found that the only exception of any importance to this rule is that a part of South America falls over China. But only one twenty-seventh of the land area of the world has land antipodal to it.

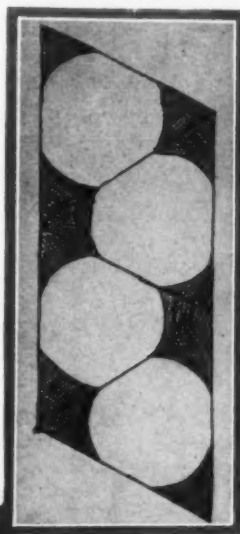
These curious facts require explanation, for it is unthinkable that this is all due to chance. The elucidation of these facts we owe to Mr. Lothian Green, who worked out the tetrahedral theory, before mentioned, in detail, he being the first man to do so.

While studying the land and water distribution on the surface of the earth, Green came to the conclusion that this was precisely what we should expect, were we to construct a tetrahedron, drawing slightly overlapping circles on the triangular faces of the figure. If we construct one, by marking a folding piece of

### A New Theory as to the Formation of the Earth which Explains Some of its Peculiarities



A tetrahedron formed by folding the cardboard prepared as shown in the illustration below. The approximate areas of land and water may here be seen



Cardboard cut and marked in the proper form to insure bending it into the shape depicted. It will be seen that it consists of four equilateral triangles

Thus, each of the corners or "coigns," as they are called, is opposite a flat surface, and vice versa,—if the cardboard be bent up into a four-sided equilateral figure, as shown. The portions enclosed in circles represent, roughly, five-sevenths of the total area, while the remaining space about the "coigns" totals about two-sevenths—the proportions of land and water on our globe. And there are three coigns about the upper portion of the figure, and only one at the bottom. Finally, the down-pointing edges of the coigns point "south".

If we were to suppose a central pull of gravity in this tetrahedron, as there is in our earth, and it were covered with land and water, the water would naturally tend to flow onto the flat surfaces, as these are nearer the center of gravity than are the coigns. The latter would therefore remain above water, and form "continents." There would, therefore, be three of these in the northern hemisphere, and one in the southern, near the south pole. Further, the earth would be slightly top-shaped. This has lately been shown to be the case.

The theory is, therefore, that, as the earth cools, it tends to fall slightly into this tetrahedral form; and it does this because this is the shape which offers the greatest surface area—as the sphere offers the smallest. Experiments with a tube have revealed the fact that, under great pressure, it will tend to assume this shape. The earth, therefore, becomes slightly tetrahedral in shape, and as it does so, earthquakes, and other convulsions of nature follow. This tendency is overcome, however, by the spinning of the earth on its axis, which tends to make the earth again spherical in shape. Thus the two forces work



A map of the northern hemisphere on which is projected the land of the southern hemisphere. It will be seen that practically none of the latter falls over the northern land except China

against each other, and keep the earth in very much the same shape from age to age.

It is true there are details in this theory which need explanation, such as the non-existence of the south polar continent, etc., but these have been very largely disposed of by newer researches. It would take too long to elaborate these here. Suffice it to say that the principles of the theory above outlined are now thought to be substantially correct. This view also enables us to explain many odd facts, hitherto inexplicable. The tetrahedral theory may well be reckoned one of the successful world-theories put forward of late years.

It may be proved by later explorations that there once existed a continent at the south pole. Up to the present time this region has not received much attention from explorers but should the previous existence of a continent be proven, the tetrahedral theory will be in entire agreement with the principal geographical features.



The metal tube shown as the dark ring under pressure collapses into the shape shown by the shaded portion

cardboard, as shown, it will be found that there are many odd coincidences between this figure and the "homologies" before mentioned.

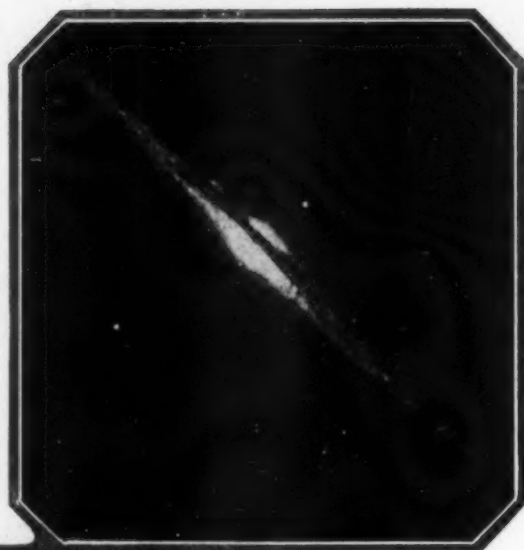
# Astronomy and Chemistry

## Newer Marvels in Astronomy

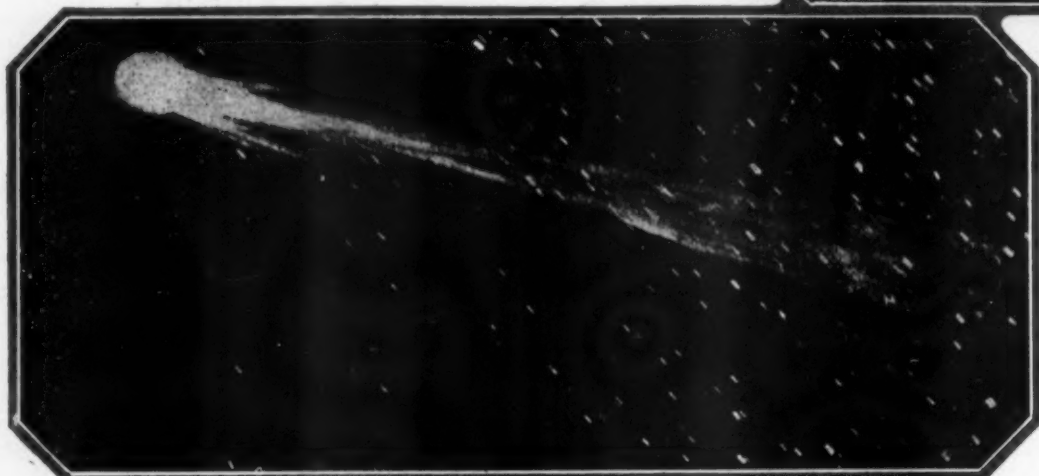
THE philosopher Laplace was one of the first to formulate a definite theory of the structure of our world, that is, one which was in accord with facts, and which seemed to rest upon a secure and substantial basis. Hence, it was called the "Laplacian theory." For about a hundred years, this theory was accepted as final; and it was only relatively recently that it was challenged, and facts produced which seemed to contradict this theory. The theory simply said that the sun, from an incandescent state, gradually cooled, and in doing so, threw off fragments of itself—which fragments formed our earth and the various planets. These lesser bodies naturally revolved in the same direction as the original mass, just as a lump of dirt would travel in the same direction as the wheel which threw it off, if pulled round by gravity, after being

luminous mass, destined to become the "sun" of this solar system; the outer edges of the plane being darker by contrast, showing that a cooling process is going on. This beautiful photograph was taken by G. W. Ritchey.

The second photograph shows us a comet, in full motion. The tail is always turned away from the sun, for the reason that the pressure of the light rays press the light matter of the tail away, while the relatively heavy "head" resists the pressure. This fact was among those which caused Arrhenius to formulate his now well-known theory of "light pressure", and its relation to life in our universe, and some of the heretofore unexplained phenomena



Above—A spiral nebula turned edgewise showing its flat disklike appearance. The glowing mass in the center represents the future sun of this now forming solar system

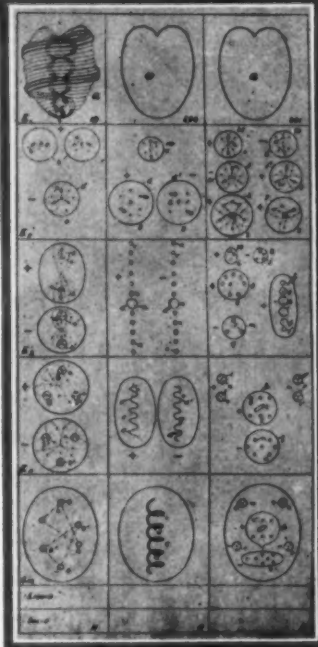


At the left—The comet with its luminous head and mistlike tail streaming behind it. From this we can see that the sun must be situated to the left of the observer since the tail always points away from the source of light

thrown off. However, it was observed that certain bodies traveled in an opposite direction; and because of this fact, and other facts, the older theory gradually gave way to the newer "Planetesimal" theory of Chamberlain and Moulton, which contends that the earth, instead of being part of an original fiery mass, is the result of the gradual accretion of cold, smaller bodies, which combined together, under the force of gravitation, until they formed the bodies we now see.

However, there are many spiral nebulae in the heavens; that is certain. We can see these in the process of formation; and in fact the newer theory is that the whole milky way is nothing more than a colossal nebula, as Arrhenius, the famous Swedish chemist and astronomer, has shown. Further, it is becoming more and more evident that there is a striking similarity between the structure of the atom of matter and the structure of the whole stellar universe. This similarity is, in fact, one of the most striking discoveries of modern science. It shows us that the Universe, from the tiniest particle, to the gigantic Cosmos, is based on one general principle—the spiral. In the heavens we can see this formation in the spiral nebula.

Many of these can be seen from above as it were. Our illustration shows us one from the side view, a much rarer sight in the heavens. This is a nebula in the Constellation of Coma Benedices; and it appears edgewise to the earth. This illustration throws valuable light upon the constitution of our solar system; for we see here the central



The jerboa, a kangaroo of the rodents

The formation of the atom according to occult chemistry. It will be understood that all three of the elements here depicted originally evolve themselves from the primitive swirl of ether shown at the top

even magnify matter, in much the same way that a microscope can magnify it—only to a far greater degree. In this manner, the structure of the atom is said to have been investigated.

The illustration is intended to show the inner nature, or structure, of three common "elements"

Hydrogen, Oxygen, and Nitrogen (designated by the small letters in the right hand bottom corner of each column). The solid and the liquid states of these elements are ignored; the lowest diagram, in each case, representing the gaseous state of these elements.

Modern science admits the existence of an "ether." Occult science says there are several ethers. Here we have four ethers, designated by the small letters E<sub>1</sub>, E<sub>2</sub>, E<sub>3</sub>, and E<sub>4</sub> in the diagram. These all represent the etheric structure of the atom, beyond the ordinary gaseous state of the element as we have it in ordinary chemistry.

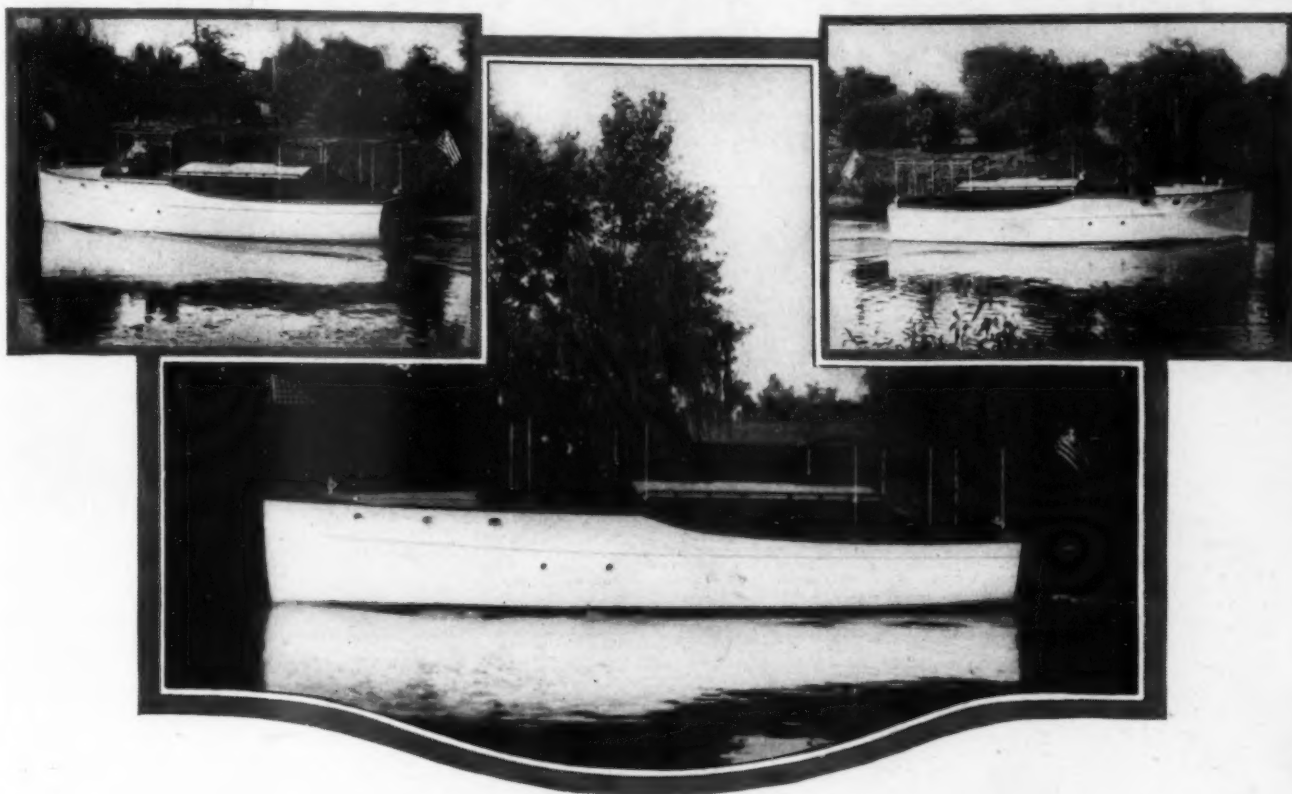
The process of formation is described thus:—

"The building of a gaseous atom of hydrogen may be traced downward from E<sub>4</sub>, and the lines given in the diagram are intended to indicate the play of the forces which bring about the several combinations. Every combination begins by a welling-up of force at a

(Continued on page 82)

## The Constitution of Matter, According to "Occult Chemistry"

OF the many speculations as to the ultimate constitution of matter, none has been more ingenious than the view advanced by certain "occultists", based, it is said, upon direct higher sight. Certain individuals, it is claimed, have the power of seeing by other means than by the aid of their physical eyes; they can see events which are transpiring at a distance; events which have transpired in the past or are about to happen in the future; can see through solid objects, and



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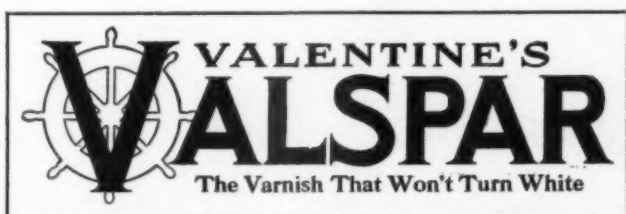
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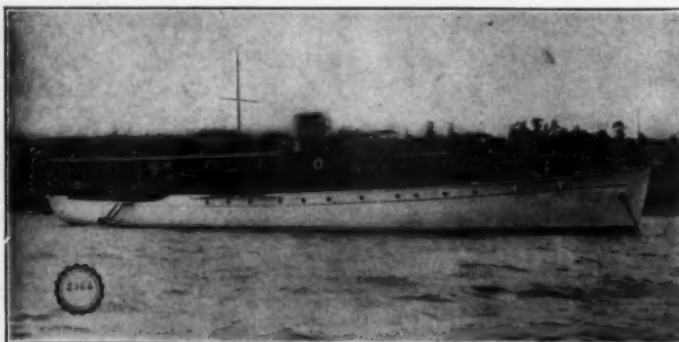
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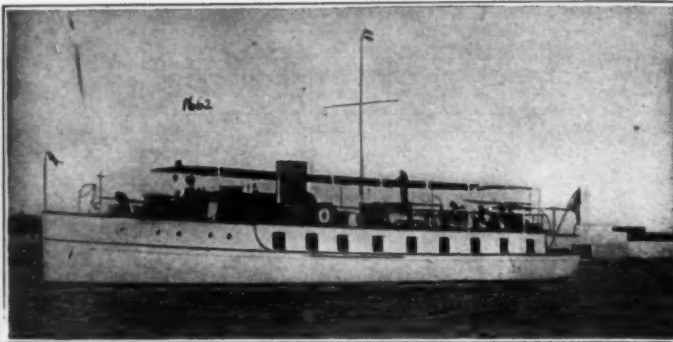
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We have a complete list of all steam and power yachts, auxiliaries and houseboats available FOR SALE and CHARTER. A few are shown on this page. Plans, photographs and full particulars furnished on request.



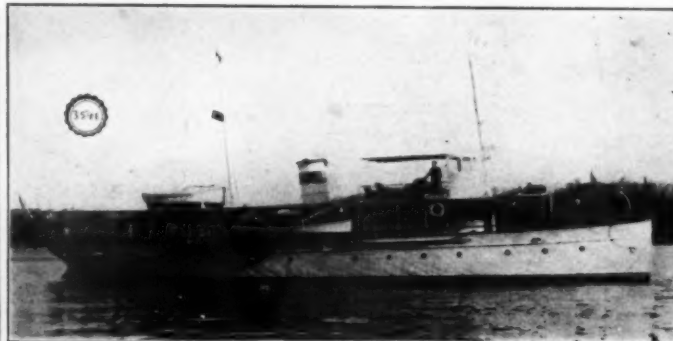
No. 2366—For Sale—Particularly desirable steel, twin screw cruising power yacht; 126 x 18.6 x 6 ft. Recently built in best manner; exceptionally able craft. Speed 12-14 miles; two 125/150 H.P. 6 cyl. air-starting motors. Large deck dining saloon; main saloon, five staterooms, two bathrooms, etc., aft. All conveniences. Handsomely furnished. Cox & Stevens, 15 William Street, New York.



No. 1662—For Sale or Charter—Attractive 90 ft. twin screw gasoline houseboat; speed 10-12 miles. Large saloon, four staterooms, two bathrooms; all conveniences. Handsomely furnished. Cox & Stevens, 15 William Street, New York.



No. 148—For Sale—Steel, flush deck, steam auxiliary schooner yacht; 130 ft. overall, 110 ft. waterline, 26 ft. beam, 13.6 ft. draft. Speed under power 9 knots; compound engine; electric lights; all conveniences. Extremely able craft; heavily constructed. Cox & Stevens, 15 William Street, New York.



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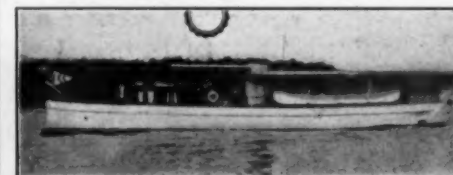
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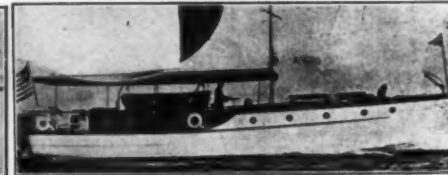
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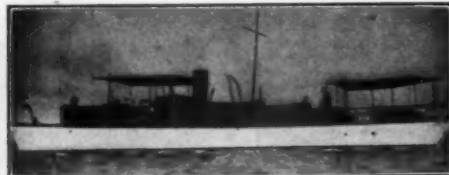
No. 2560—For Sale—Fast, V-bottom, twin screw power cruiser; 60 x 13 x 3 ft. Built 1917. Speed up to 18 miles; two 6 cyl. Sterling motors. Double stateroom forward; roomy saloon aft with separate galley; two toilet rooms (one with Sitz bath). Low price for quick sale. Cox & Stevens, 15 William Street, New York.



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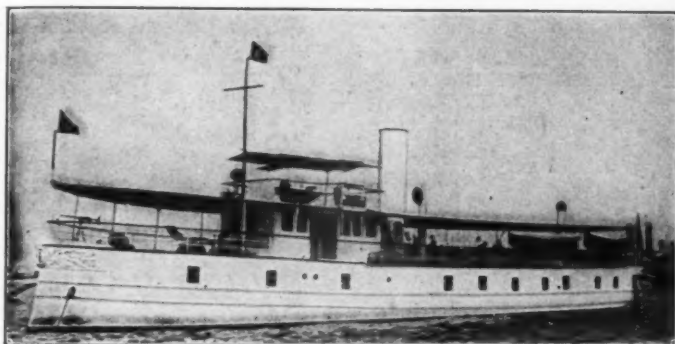
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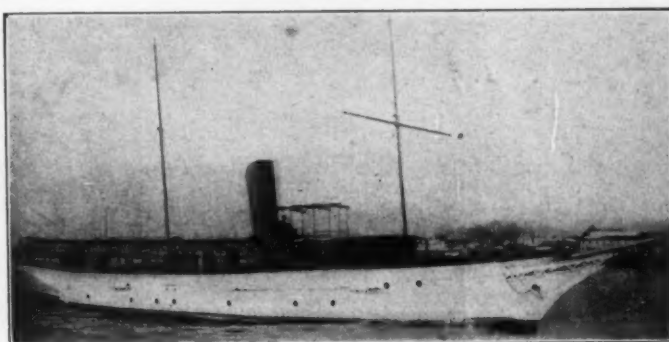
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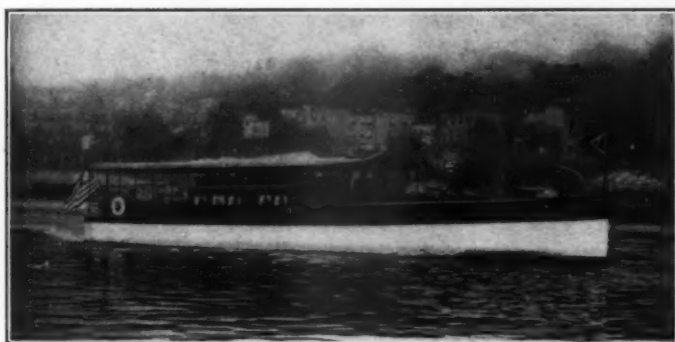
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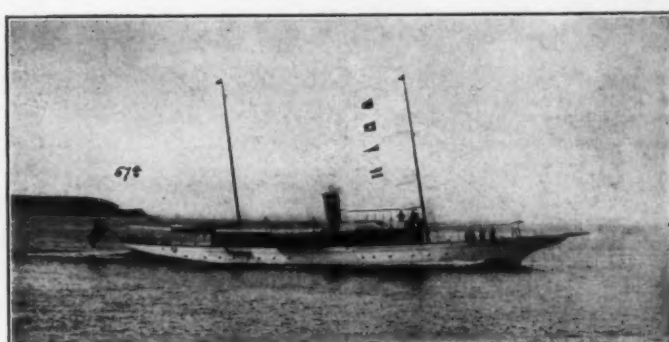
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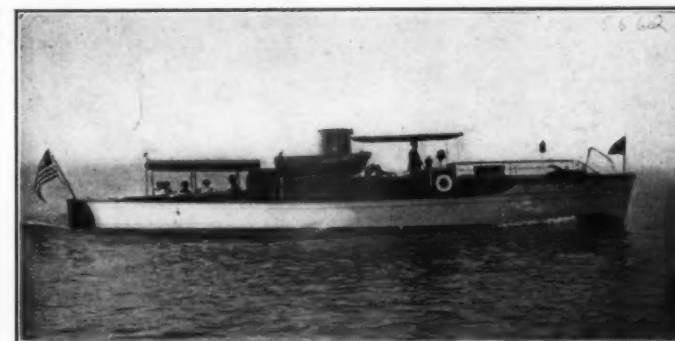
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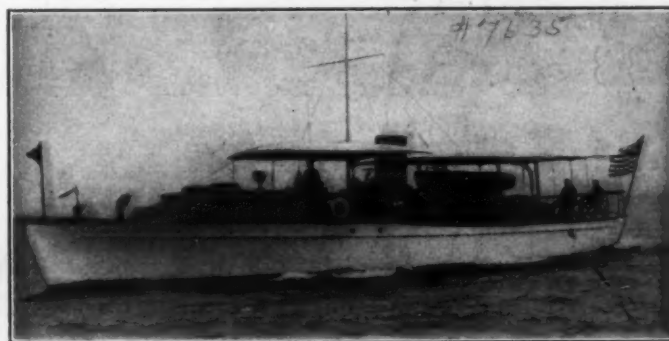
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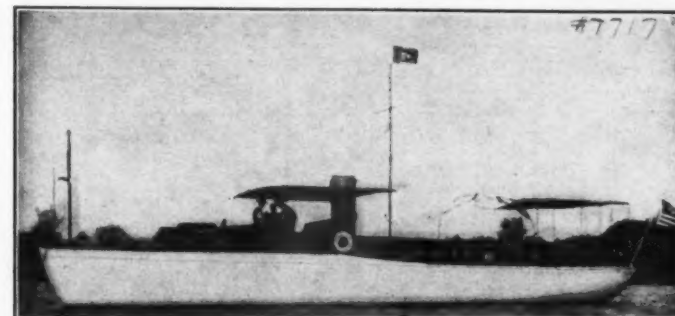
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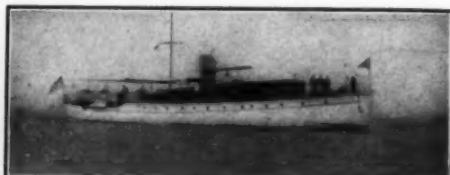
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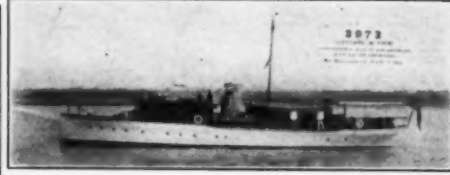
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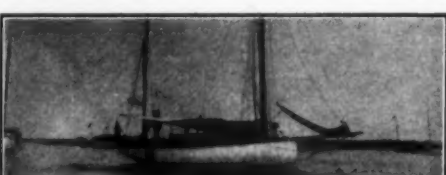
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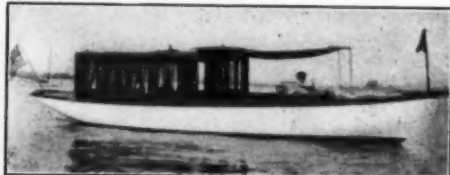
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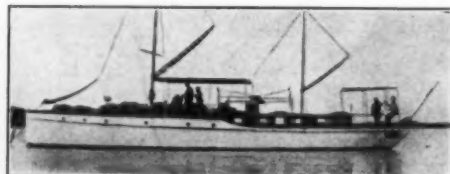
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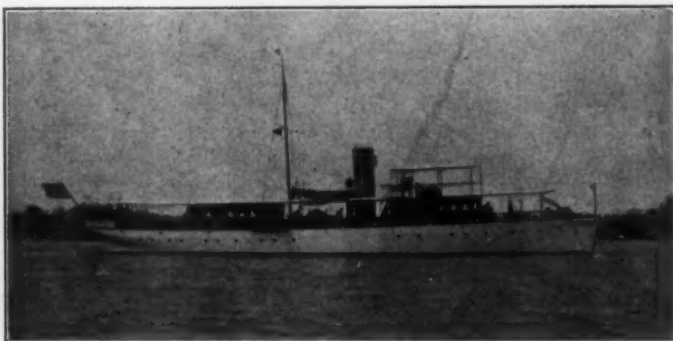
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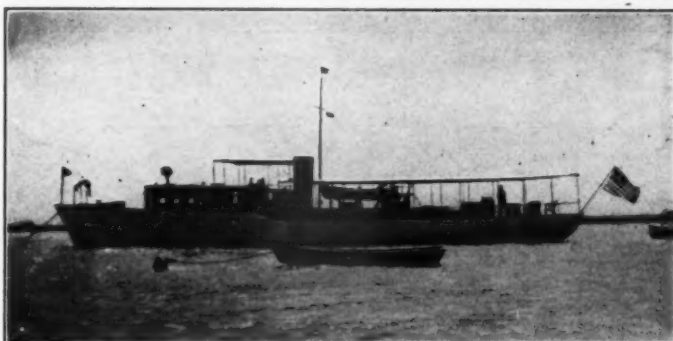
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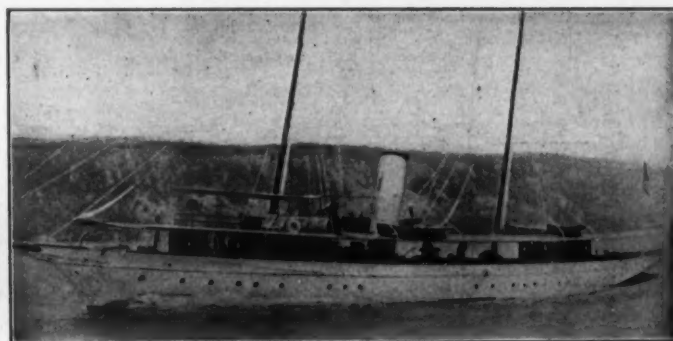
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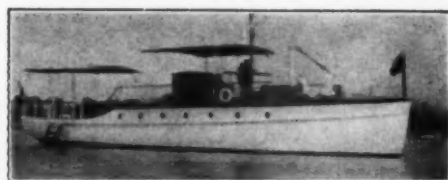
No. 646—For Sale or Charter—Steam yacht 123 ft. x 17 ft. x 6 ft. draft. 5 staterooms, 3 bathrooms. Dining saloon and social hall on deck.



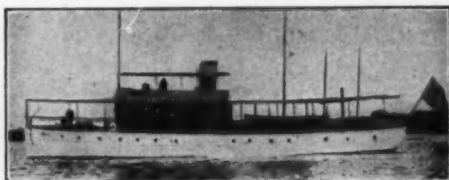
No. 1081—For Sale—Twin screw, 90 ft. power yacht; splendid accommodation. Recently overhauled and 2 new Standard engines, 4 cylinder, 75 h.p. each, installed 1916. Exceptionally able and fully found.



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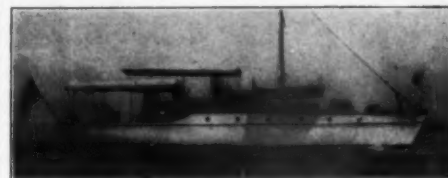
No. 1908-L—Raised deck cruiser, 56 ft. by 12 ft. 6 in. by 3 ft. 9 in.; Standard engine; speed 12 miles. Has stateroom, main saloon with transom berths, separate galley, etc. Complete equipment.



No. 1821—Flush Deck Power Yacht, 90 x 15.3, two 60 H.P. motors, 3 staterooms, etc.



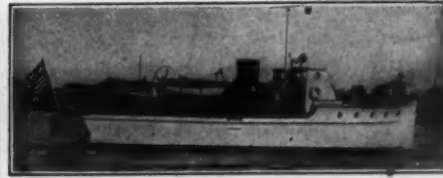
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No. 2386—New Patrol type, 54 x 11.3, eight cylinder Van Blerck, speed 17 miles.



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No. 2358—New Express Cruiser, 48 ft., eight cylinder, 200 H.P. Van Blerck, speed 23 miles.

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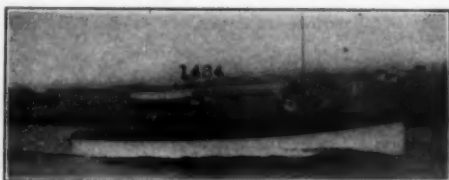
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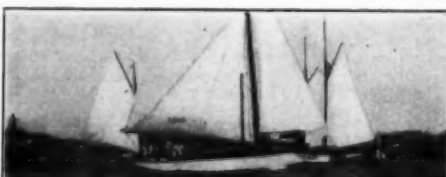
1421—82 foot twin screw power yacht. Splendid accommodations. Speed 12-13 miles.



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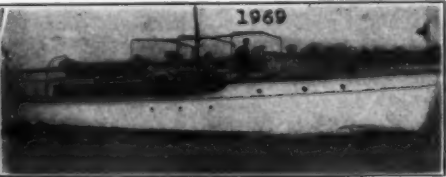
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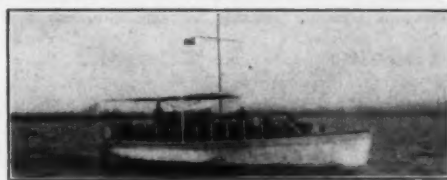
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## Hearing the Sunshine and Seeing the Wind Blow

(Continued from page 25)

Not only does this triple-self-register record the sunshine and the velocity of the wind, but it also registers the direction from which the wind is blowing and the rainfall. The rainfall is recorded by the same arm and pen that registers the sunshine. There is a rain gauge on the roof, Fig. 4, and this is equipped with a "double bucket." When one side of this bucket becomes full of rain water it automatically tips, permitting the other side to fill, etc. Each time the bucket tips it completes an electric circuit, the current traveling down to the triple-self-register, where it is recorded upon the cylinder.

There is very small probability of confusing sunshine and rainfall records, even though made with the same pen, as they seldom occur together, and furthermore, as the sunshine causes a jog in the line at regular intervals, while those indicating the rainfall occur at very irregular periods.

The wind vein is also connected electrically with the triple-self-register. When the wind is blowing from either the north, east, south or west a single dot is recorded, but when it blows from the northeast, southwest or the like, two dots are recorded at each closing of the electric circuit. The steady turning of the cylinder results in the making of a row of dots, as is the case with each of the other arms, upon the paper covering the cylinder. The taking of a twenty-four hour record of all of these instruments is made possible by the fact that in addition to turning around the cylinder moves endwise, the lines of dots, therefore, being of a more or less zig zag character. The hours of the day are registered by transverse lines upon the paper which covers the cylinder.

## Tractoritis

(Continued from page 60)

worked. Coy let his thirteen-year-old son, Hershah, operate it to show its simplicity. "After that," says Coy, "all the farmers began buying tractors. They put their machines through all kinds of work which a tractor is capable of doing; plowing, discing, hauling, sawing wood, grinding feed, and husking corn."

Hershah Coy may be seen in the picture officiating at the motive power of his father's corn-husking bee. The tractor they find is so tractorable that even the women of the farm can operate, and are operating them and solving the problem of farm help.

Mrs. Chris Henninger, R.F.D. Arcanum, Drake County, O., was a bit timid when she first climbed upon the seat behind the steering wheel of her husband's tractor, but she soon got over that, however.

Mrs. George Clayton, Preble County, also runs her own tractor.

The women claim it is just as easy to run a tractor as it is to operate the family automobile and plowing with a tractor is really a pleasant task, besides it saves the farm two hired men and six horses.

Farmers find that tractors are cheaper to maintain than horses, especially now that the price of feed is so great. It plows on an average of six acres a day in contrast with two acres by the old horse-and-plow method. It takes the place of two men and six horses and is seldom "sick" and in winter time it doesn't "eat its head off" while standing in the barn.

## Did You Enjoy Your Breakfast?

(Continued from page 27)

them and falls upon the sensitive plate. To provide a ready means for measuring the image of the egg and of the air chamber, and thus determining the relative size of the latter, M. Le Roy got up a rather clever transparent gauge. This, consisting of six lines radiating from a common center and crossed by a number of concentric circles, may be laid over the print, or, by insertion between the plate and the paper during process of printing, may actually be made a part of the record.

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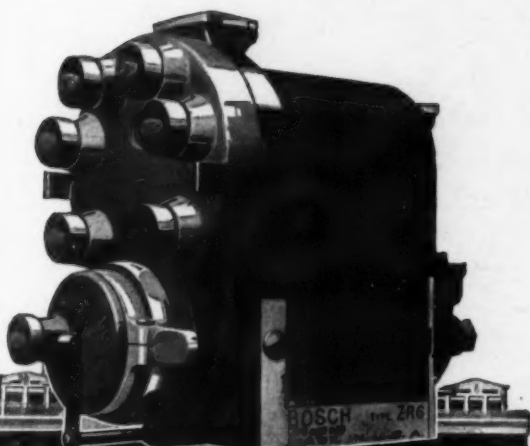
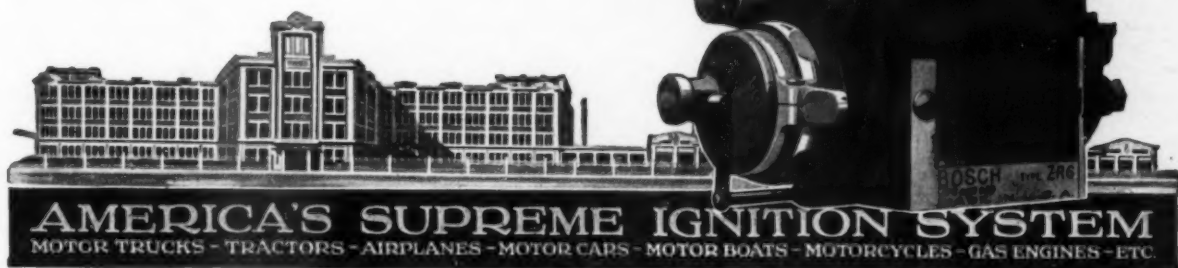
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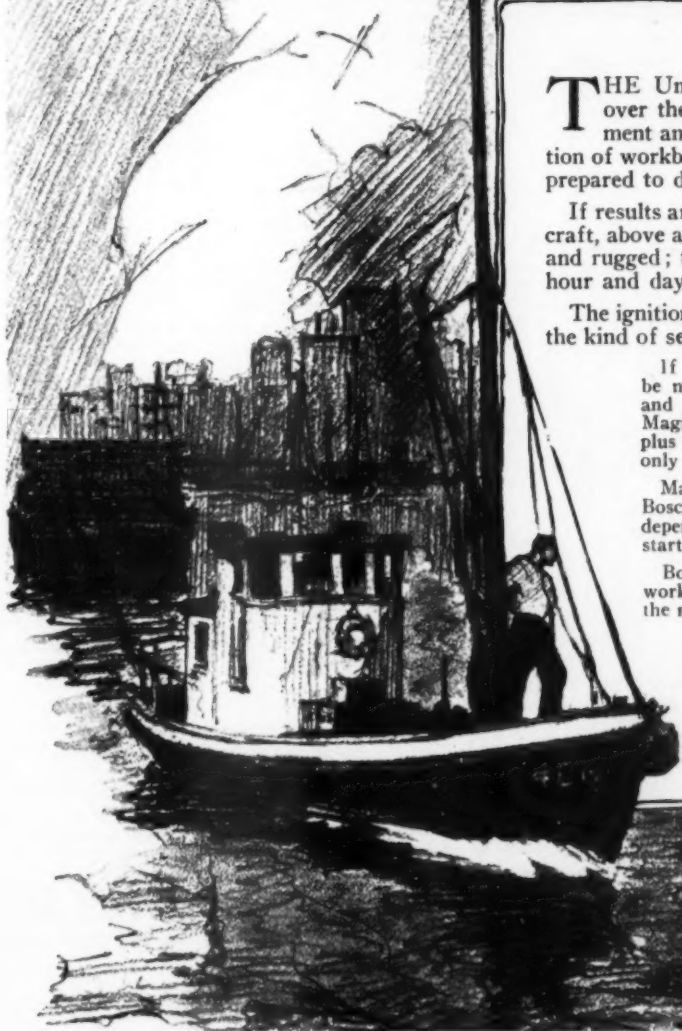
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# Plans All Arranged for Gold Cup and Toronto Races

A MEETING of Western yachtsmen was held on Wednesday, June 26, at the Detroit Athletic Club. There were present Commodore A. L. Judson, president, and Charles F. Chapman, Editor of *MoToR BOATING* and secretary of the American Boat Association's Racing Commission.

In addition to a number of the prominent members of the Detroit Yacht Club there were present Commodores D. T. Lorimer, and Harry Austin, of the Detroit Boat Club; Commodore Gunnison, of the E. B. C.; Commodore R. George Marsh, of the G. P. Y. C., and Lee J. Barrett, of the Miss Detroit Power Boat Association.

The chief point of discussion was as to the dates for the Gold Challenge Cup Races.

As often happens, matters which at a distance appear very antagonistic, are found to be not so very far apart when the principals get together. It had appeared to Detroit that Toronto wanted to grab her dates, and Toronto thought that Detroit was standing obstinately in the way of Canadian interests. But when real sportsmen got down to brass tacks, the question resolved itself into an effort from each city to find a way to accommodate the other without sacrificing her own interests.

Commodore Judson represented the American Power Boat Association and was in a manner umpiring between the two. He and Mr. Chapman had, however, just come from Toronto, and very ably and staunchly took care of their interests, while they were perfectly ready to accede all fair claims made by Commodore Schantz and the twenty other Detroit yachtsmen present.

It appeared that Toronto would be satisfied with dates during the week of Labor Day, so as to hold their races during the days when the National Exhibition was being held. After discussing the necessary time for shipping the racing boats from Detroit to Toronto, it was agreed that Detroit should hold the Gold Challenge Cup Races on Labor Day and the Friday and Saturday previous, with the Sunday in between as a spare day in case it was needed. To make further provision for unfinished races, it was agreed that in case of any unfinished point of racing, the decision should be made at the Toronto races.

There will in all probability be a Toronto boat entered in the Detroit Races. No details could be learned about her, not even her name. She is a veritable dark horse, being built behind locked doors. She intends to give us some fight.

A resolution was passed that Commodore Schantz should appoint a committee of three to take care of the shipping arrangements with all the required dispatch, and that they should particularly look after all that was necessary for reshipping the Toronto boat.

## *History of the Gold Cup Plans*

In October, 1917, Commodore Rennie, of D. Y. C., called together at the D. Y. C. Clubhouse the men who would probably be most interested in planning to conduct the Gold Cup races of 1918 which the Detroit Yacht Club fell heir to through Gar Wood's sportsmanship with his Miss Detroit II at Minneapolis. There was considerable talk about how it was done in 1916 and many good suggestions for 1918 were made.

In January two more meetings were held, one at the Pontchartrain and one at the Tuller. A committee known as the Ways and Means Committee to draft a plan of campaign, for planning the regatta and building a cup defending speed boat was appointed. Commodore A. A. Schantz was picked to head the movement and Theo. F. Henry, of the Detroit Yacht Club, was chosen secretary.

The Ways and Means Committee reported that a general committee representing as many organizations, yachting, civic and business, as could be enrolled, would make the work of raising funds to build a boat easier than to let the D. Y. C. undertake the whole load. That

idea was adopted and committees were named to handle the work by picking men from various local groups whose interest and co-operation were desired.

In February Commodore Schantz went to Florida for a vacation but before going got things started so that on February 19, a big meeting of boosters was held at the Board of Commerce Auditorium, following a dinner at the Detroit Athletic Club, entertaining Commodore J. Francis Schefcik, of the Minneapolis Boat Club; Professor Herbert C. Sadler, Naval Architecture Expert from University of Michigan and others who had been brought to Detroit to help boost the Gold Cup preparations. It was a dark and stormy night, the heaviest rain of the year, but the real sailors were on deck and about 100 live wires listened to how it was done at Minneapolis, as Dr. Schefcik related, and why it is a good thing to develop fast boats and promote speed boat racing as Professor Sadler recommended. Commodore Alex. I. McLeod was chairman of the meeting. When Commodore Schantz came home April 1 the Committee sat down and signed up with Chris Smith, and Chas. D. Cutting announced he had secured a motor from the Curtiss Aeroplane Company to be used in the new hull. During May and June the Smiths did their work, and at this writing the Miss Detroit II is a reality and promises to be a world-beater. Liberty Engines and other engines had been discussed several times and committees had been appointed to investi-

of charge, held over the beautiful Detroit River course in front of the Yacht Club.

## Facts About Miss Detroit III, Gold Cup Defender for 1918

THE hull is of the one-step hydroplane design, the step being about 6 inches deep, length over all 20 feet, beam 6 feet 6 inches, draft when at rest about 8 inches. All planking is full length of the boat with no butts. The side planking is of mahogany, the corner pieces or bilge stringers are of white ash, the bottom planking is of butternut, the keel and stem are of sassafras and the transom of mahogany. The ribs are 6 inches on centers,  $\frac{3}{4} \times \frac{1}{2}$  inches, of red elm, bent to shape, with planking copper fastened, with no putty covering the fasteners. Heavy sawed frames, bolted at the bilges are placed close together throughout the hull to reinforce the bent frames to give greater strength for sea work than the former champions have had. Two-inch white pine bed pieces run the full length of the hull on which the engine is mounted, these pieces being cut to fit the engine. The hull is finished with one coat of shellac, a coat of filler, then four coats of varnish and the bottom is pot leaded. Two seats at the stern for mechanic and driver are of elastic webbing to take up the vibration caused by fast driving over rough water. The auxiliary oil tank is under these seats. There is a self-bailer through the bottom of the hull close to the stern which acts automatically when the cock is opened and the boat is under way, sucking the water out rapidly as the boat's speed forces the water to the stern and the suction pulls it out through the bailing cock.

The deck is of butternut,  $\frac{1}{4}$ -inch, canvas covered, the deck beams being of black cherry. There is a slight coaming around the cockpit which is 11 feet long by  $5\frac{1}{2}$  feet wide. A hatch forward of the cockpit gives access to the gear box. The deck forward of the cockpit is concave so that the fast rushing air when the boat is under way is shot up over the heads of the driver and mechanic, saving them much annoyance.

The rudder stem projects through the keel 7 feet back of the bow, a stiff post extending 12 inches below the keel through a stuffing box, with a quadrant on top with bronze cables running along both sides of the hull inside to a drum on the steering post on the starboard side about 3 feet forward of the stern transom. The steering gear cannot fail, as it is too strongly built and substantially braced.

The shaft projects from the hull through the step, through a carefully made stuffing box. When running the boat planes so that it is out of water back to the step and back of that it rides on a cushion of air formed in the pocket under the hull to the stern of the step, the air accumulating there being unable to escape into the water below or to either side because of the high speed. By altering the plan of installing the engine a little new Miss Detroit will be driven as nearly parallel with the surface of the water as it is possible to, so that she will fairly skip on the top of the water when she gets under way.

Two gas tanks of large capacity are placed forward of the engine, one on either side.

The hull is 20 feet long because the Smiths found that length to be about the minimum length to allow proper floating capacity with the least skin friction. The first twenty-footer was built to enter the Mississippi Valley class races from 20 to 40 feet, the idea being to have a boat of sufficient power to enter her against all contenders in any class from 20 to 40 feet.

The new hull is 6 inches wider than the hull of the Miss Detroit II to take care of the higher weight of the Curtiss motor. It is built lower than previous champions to reduce wind resistance.

If the war should end soon and the Harmsworth trophy now held in England should be

(Continued on page 82)

## The Two Big Regattas of 1918

Gold Cup Races at Detroit  
Aug. 30, 31, Sept. 1, 2, 1918

Canadian International  
Championship Races at Toronto  
Sept. 4, 5, 6, 1918

gate them, but the Curtiss motor built for the "Miss Miami," Glenn Curtiss' speed boat, was deemed the best bet and Cutting's offer was accepted with thanks. They had made some improvement in hull design over previous champions, based on their experiences of 1917.

At the Detroit Athletic Club on June 25, a meeting of about twenty members of the committee with President Judson and Mr. Chapman solved the problem of dates. The Detroit Committee agreed to set their dates for August 30, 31 and September 2, with the mile trials to be staged on Sunday, September 1, if necessary, and the Detroit enthusiasts promised that they would make their best effort to get all the contesting boats away the night of September 2 for Toronto so that they could participate in the Canadian events on September 4, 5 and 6, the dates that President Judson thought would be agreeable to the Toronto sportsmen.

Whip-po-will and perhaps Hawkeye, representing the Lake George Club and the Lake George Regatta Association, will be at Detroit for the races, also a dark horse entry from Toronto, which is being built to "cop the cup." These three boats and the two Detroits and the Miss Minny, will be shipped aboard special cars and expressed from Windsor to Toronto as soon as possible after the finish of the third heat of the Gold Cup event.

Detailed preparations for the regatta will now go forward since the date matter is settled, and Detroit will witness one of the greatest regattas the country ever had. The Detroit Yacht Club and the whole city of Detroit will benefit by the big turnout of people who will be entertained and interested by the premier speed boat event of the world, free



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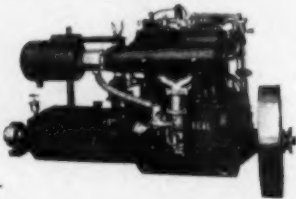
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## Astronomy, Chemistry, Zoology

(Continued from page 70)

center, which is to form the center of the combination; in the first positive hydrogen combination,  $E_1$ , at atom revolving at right angles to the plane of the paper, turning head over heels, if the expression be allowed, and also revolving on its own axis, forms the center; and force, rushing out of its lower point, rushes in at the depression of two other atoms, which then set themselves with their points to the center. As this atomic triad whirls round, it clears itself a space, pressing back the undifferentiated matter of the plane, and making to itself a whirling wall of this matter, thus taking the first step towards the building up of the chemical hydrogen atom. These atomic triads then combine, two of the linear arrangement being attracted to each other, and two of the triangular,—force again welling up and forming a center and acting on the triads as on a single atom, and a limiting wall being again formed as the combination revolves round its center. The next stage is produced by each of these combinations on  $E_2$  attracting to itself a third atomic triad of the triangular type, from  $E_2$  by the setting up of a new center of up-welling force, following the lines traced in the combinations of  $E_1$ . Two of these uniting, and their triangles interpenetrating, the chemical atom is formed, and we find it to contain in all eighteen physical atoms."

The other elements can be analyzed similarly. It will be seen that all these elements, as all others, ultimately resolve themselves into the same primitive swirl of ether, of which they are all expressions, and in which they all originate.

## Plans All Arranged for Gold Cup and Toronto Races

(Continued from page 80)

raced for again, this boat may be entered and therefore is built strongly for such an event, which might be held in the open sea. In the last races at Huntington the Smiths had the Baby Reliance entered but though she led while in the smoother water she was passed when the Maple Leaf met the heavier seas outside the Bay.

The Curtiss motor built for the Miss Miami, Glen Curtiss' speed boat, is to be used. It is a V-type, twelve cylinder motor with overhead valves, the valve mechanism exposed.

The intake valves are water-jacketed. The exhaust valves project through the exhaust manifolds which are slightly curved inward and upward. The manifolds are about 12 inches in length. The intake valves and stems must withstand terrific heat and therefore the ones originally on the motor have been replaced by new ones of special metal that will be as strong when red-hot as when cold.

The crankcase is of aluminum alloy. The pistons are of magnesium metal weighing 2 pounds  $8\frac{1}{2}$  ounces each with three rings each.

The crankshaft is counterbalanced, with heavy castings bracing the case between each crank throw. The crankshaft is  $2\frac{1}{2}$  inches in diameter.

The cylinders each weigh  $15\frac{3}{4}$  pounds with complete water packet and 12-inch manifold attached. The cylinders set at an angle of 60 degrees. They are of 20-point carbon steel, the water packets being of mono metal. The bore and stroke of the motor are 5 x 7 inches. Each cylinder is fastened to the crankcase by twelve bolts.

Seven pipes of  $1\frac{1}{4}$ -inch diameter through the crankcase, projecting on either side, passing through the castings and strongly built for reinforcing the crankcase and to support the weight of the cylinders, etc., provide rests for setting the engine on its bed, making fourteen strong points for fastening the engine to the bed.

Water circulation to the jackets is accomplished by two pumps, each serving six cylinders.

Oil circulates under 30 pounds pressure by pumps, the supply in the crankcase being re-

(Continued on page 86)

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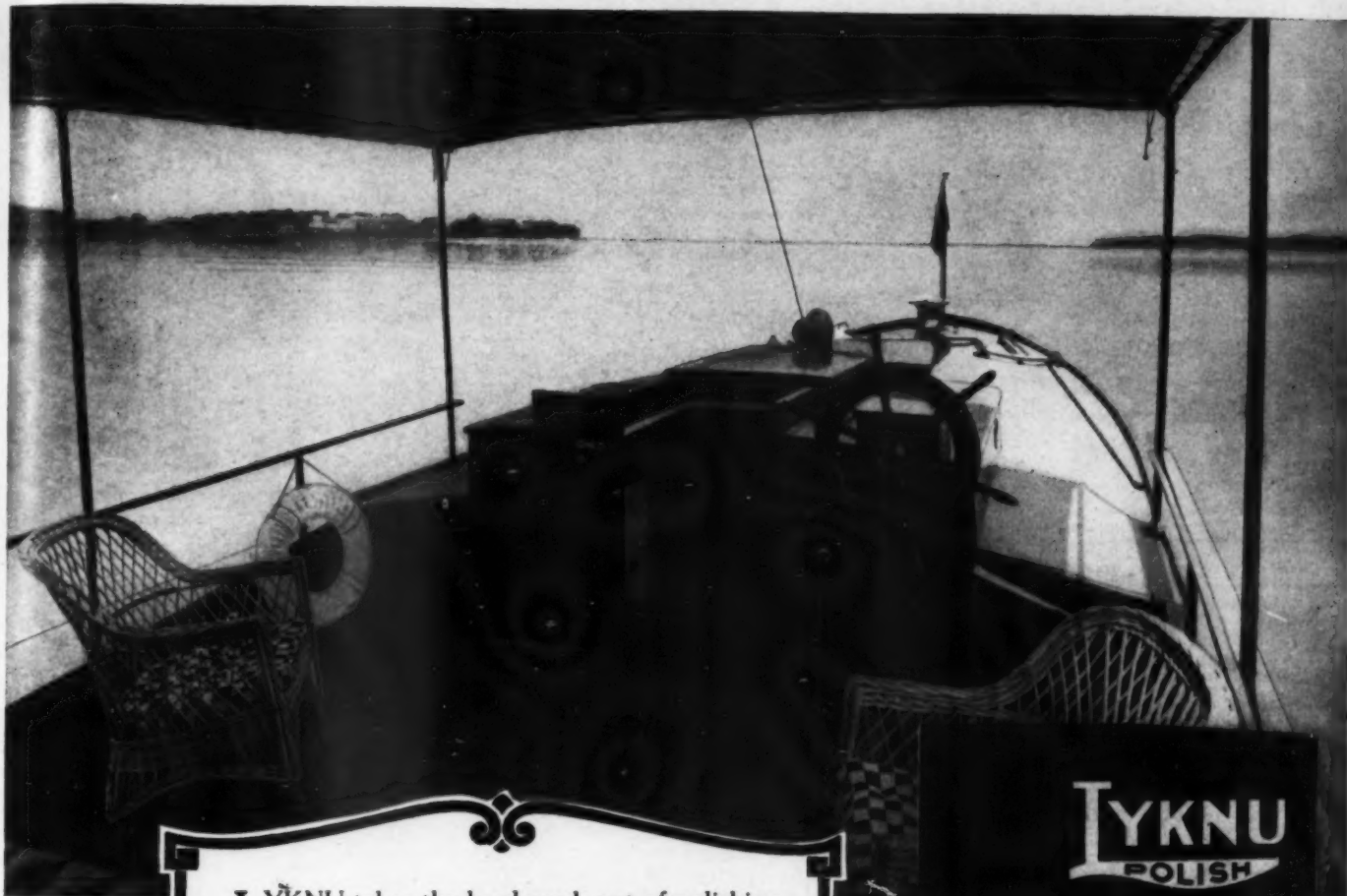
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## Games for the Blind Soldiers

(Continued from page 29)

the "mathematics frame" was invented. Now he adds, subtracts or multiplies just as any school boy does with a pad and pencil. His numbers are cast in type. Various positions of the T, L, "triangle" and "square" are used instead of the ordinary arabic numerals. These are not only easier to read by touch, but are also a real economy in type. By using the two ends of each piece only two type pieces are necessary. "T" in the different positions is 1, 2, 3 or 4. "Triangle" is 5, 6, 7 or 8, "L" is 9 and the "Square" is zero. A blind man sits down with this board and extracts a cube root as quick as you or I, if we have not already forgotten how, can do it with a pencil.

## Semaphore Experts

(Continued from page 32)

An instance somewhat on this order occurred in the Brooklyn Navy Yard last fall when the Q.M. of one of the 110-foot S.C. boats—a man who had served a hitch in the regular outfit and had recast in the Fleet Reserve—wanted to chew the fat with a battleship, and spelled out a message at the conventional eighteen-word rate. The signal boy on watch on the battleship's bridge, thinking it a good occasion to display his prowess, climbed the rail and shot back a sentence at the best of his ability, intending, no doubt, to smother the Reservist. But it happened that this Reservist had held the fleet record during his term in the service, and so he opened up at his own best speed—which was a good ten words a minute better than the signal boy's. The latter must have had urgent business on the other wing of the bridge at just about that time, for he signalled back, "Wait a minute," climbed off the rail, and remained out of sight for the rest of his watch. Whereupon the crew of the S.C. boat gave him the raspberry, which as anyone who has seen any kind of military service knows, is always accompanied by jeering sounds, and is sometimes spelled out in semaphore like this: H-a, H-a, H-a!

## My Ideal Runabout No. 7 America

(Continued from page 51)

muffler, he can sympathize with the writer. Owing to the average runabout having a cockpit dotted with cross seats and lockers, one cannot stay aboard during the night, which only allows to take but short distances at a time, running inland, to spend the night on shore. This, however, is not the writer's idea of a real boatman, as to be able to lay off shore and sleep the sleep of the weary in comfort and confidence, arising early for a morning plunge, followed by alcohol or gasoline stove-cooked ham and eggs and ready for an early start, adds fifty per cent to the pleasure of motor boating. Therefore, from past experiences, decided on what is shown on the plan for sleeping. The bulk-head beneath the stern seat can be lifted out of place, giving a clear space of 7 feet in length, with four feet at the stern for resting the feet and about 7 feet 6 inches amidships for resting the head. With this space filled in with the boat cushions a very comfortable berth is formed for two persons and, yes, I have oftentimes slept three there. For those who require more headroom in the cabin than furnished by the cockpit cover buttoned over the coaming an auto-top makes an ideal protection from the sudden showers that usually occur following a hot day. A more inexpensive cockpit hood can be made of three or four pipe stanchions, tied together with  $1\frac{1}{2} \times \frac{1}{2}$ -inch battens on the roof, with canvas drawn neatly over them, and lashed around the last batten on either side with hemp cord drawn through one-half-inch brass eyelets.

The description of my craft America has about reached its conclusion, and if the reader feels inclined to carry out these plans, devoting a few hours each evening, Saturday afternoons and Sundays, he will find that advancing stages will be rapid and that in a short time he will have a finished product made with his own hands, and will not feel apologetic for his labors.

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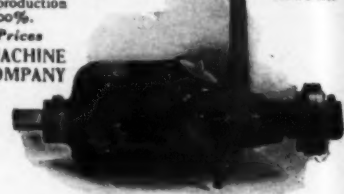
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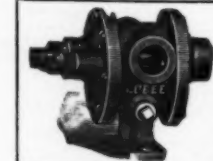
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## INTERESTING BOOKS!

Read the announcement

On Pages 77 and 92

## Plans All Arranged for Gold Cup and Toronto Races

(Continued from page 82)

plenished by the hand pump located near the left rear seat for the mechanic to use, coupled to the supply pipe from the tank under the seat. If the pumps failed to work, the mechanic could pump the crankcase full of oil and depend on the splash feed system to lubricate the motor.

The motor will be equipped with a Joe's reverse gear clutch though originally it was direct connected.

Two six-cylinder magnetos placed at the rear of the motor, on either side, have been especially tested out for the champion.

Four special carburetors, each serving three cylinders, will supply gas to the four intake manifolds, each serving three cylinders.

The camshaft is located directly above and parallel to the main shaft, the twenty-four rocker arms each attached to a forked lever working directly on either the exhaust or intake valve, the exhaust valve spring being a straight spring instead of a spiral spring. The camshaft is in the V between the cylinders. The camshaft is hollow, 1-inch in diameter.

The original oil pan has been replaced by a shallower shell forming a part of the lower half of the crankcase.

There will be no self-starting device. When turned with a lever to proper position the motor will start on spark.

The engine and equipment in the Miss Detroit II. weighed about 1,650 pounds. The new motor weighed 1,320 pounds complete when in the Miami but changes have reduced the weight to 1,250 pounds. The motor is quite similar to the Liberty motor except it is a 60 degree angle V-type as compared with a 45 degree angle on the Liberty motor. It will turn 2,000 r.p.m. where it turned 1,650 before the Smiths started to work on it. The valve timing, both intake and exhaust has been changed so that it acts as the valves on the Miss Detroit II. do.

The gear box forward is arranged so that the driving shaft is offset from the jack shaft by five per cent. instead of six and a half per cent. as in the Miss Detroit II. This is done to save power and drive as nearly straight ahead as possible instead of up. The gear box is water jacketed to keep it cool with tight stuffing boxes arranged to keep the oil in the case, also it is provided with ball bearings and made strong and perfect as only the Smiths make them. Formerly it was the practise to pour water on the gear boxes to cool them. After the Thousand Island races last year the water in the bearings from cooling the gear box rusted the gears and bearings so that a new outfit had to be substituted hurriedly before the race at Minneapolis.

To the clutch, forward of the motor, will be connected a jackshaft which runs into the gear box forward, driving the driving shaft through gears. The driving shaft is of cold rolled steel 14 feet long by 1 1/4 inches in diameter.

At either end of the jackshaft connecting with the clutch and with the gears will be splined joints loosely fitted.

The main driving shaft runs one and one-fourth times the speed of the motor, therefore turning about 2,500 r.p.m.

The propeller is of 20-inch diameter, 38-inch pitch, is made of manganese bronze and weighs 25 pounds.

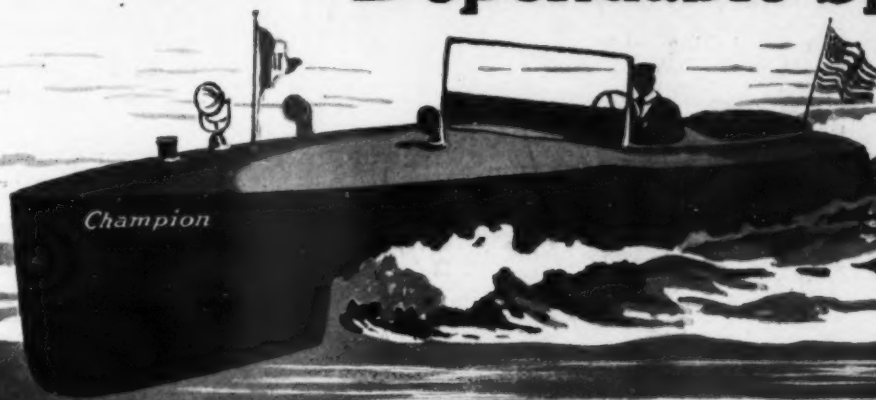
Probable list of entries for Gold Cup races:

Name of Boat	Club	Motor
Miss Detroit III	Detroit Yacht Club	Curtiss
Miss Detroit II	Miss Detroit P.B.A.	Sterling
Whip-po-Will	Jr. Lake George Regatta Association	Van Blerck
Hawk Eye II	Lake George Club	Van Blerck
Miss Minneapolis	Minneapolis Boat Association	Sterling
Toronto Motor Boat	(Not Announced)	



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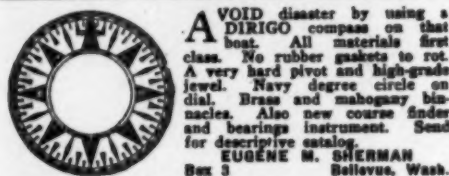
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## A Look Into the Future

(Continued from page 7)

The new machines of war will have a very important place on our pages in the issues to come. Flying and aeronautics, both vital and important issues of the day in which 100 per cent. of the people are intensely interested, will be treated in a way that everyone can understand. Engineering is a branch of science which the average man generally fears and keeps away from, believing that it is too deep and technical for him. However, much of the world's progress, especially that related to national business developments, is due principally to engineering practices. An analysis of those presented in an essentially popular way will be one of the aims of SCIENTIFIC MECHANICS.

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The same style which has made MoToR Boating a leader in its field in the past will be adhered to in the future. Authoritative articles by the best writers, profusely illustrated with the best of pictures and presented in an attractive manner will make SCIENTIFIC MECHANICS a 100 per cent. magazine. The same staff of writers whom all have grown to know so well, will continue to write for the magazine in its new form. To these will be added new names from time to time with whom we feel sure every reader will be at home.

In our office, the same editors and advertising staff will continue to serve you as faithfully in the future as they have endeavored to in the past.

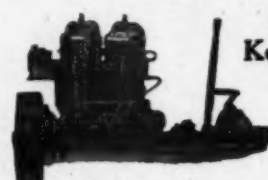
Beginning with the October issue of SCIENTIFIC MECHANICS (which will be out on September 10th) the price of a single copy will be twenty cents and a yearly subscription will be \$2.00. Even if there will be no issue known as the September number, yet subscribers and others will suffer no inconvenience as the October number will be out only a few days after the September issue of MoToR Boating would have reached them, had there been one. Naturally all subscriptions will be extended one month so that no present subscriber will be affected by the change in name, date of publication, or price.

## The Motor Boat Supply Ship

(Continued from page 39)

to good advantage, for no sooner is the anchor down than these fellows, and women too, swarm around the vessel and where permission is given to come aboard a lively trade is carried on among the members of the crews as well as the passengers.

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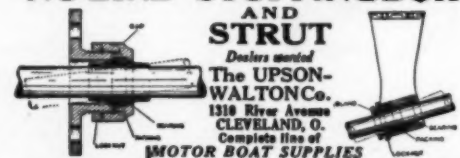
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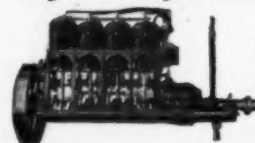
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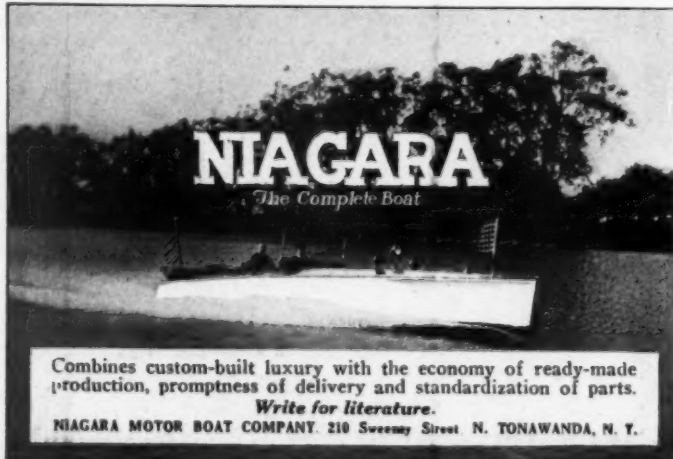
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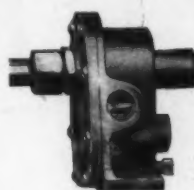
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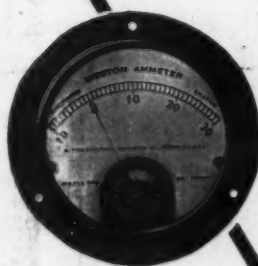
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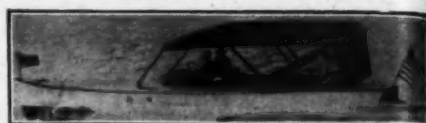
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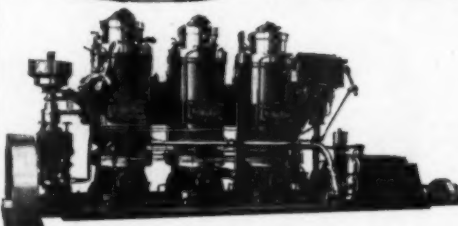
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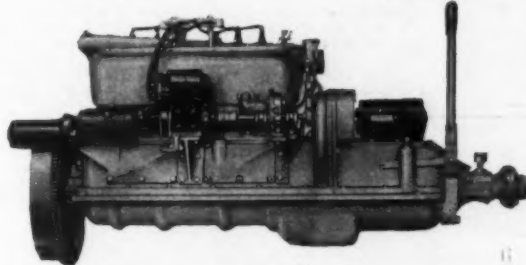
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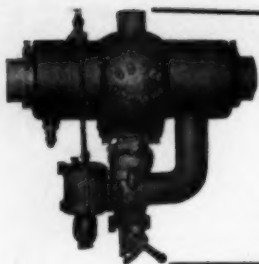
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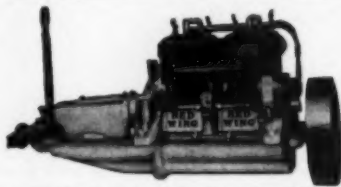
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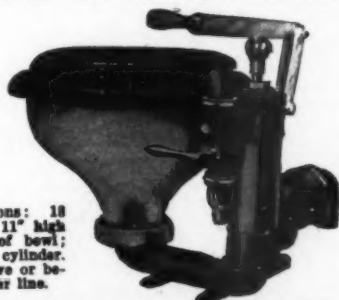


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No. 5

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Fig. 1392

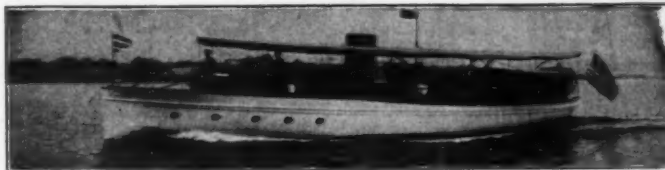
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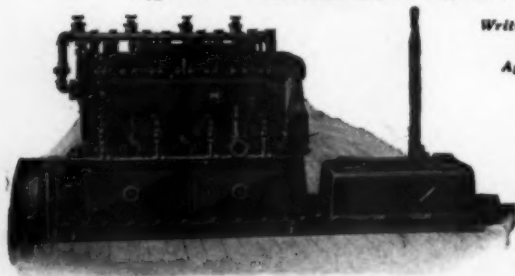
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6-Cyl. ....	6	x 7 1/2"	45-65 H. P.
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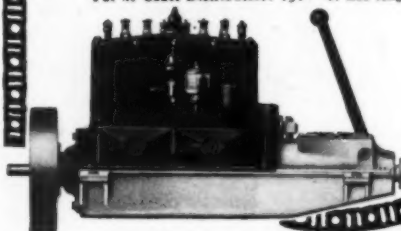
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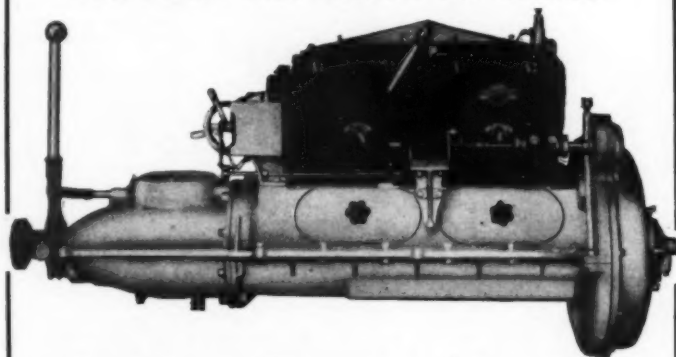
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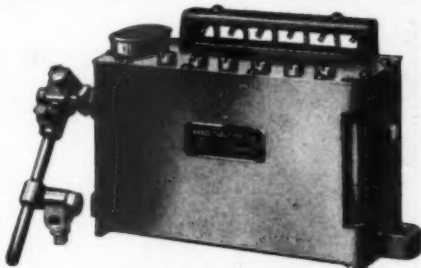
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pump the oil *under pressure* to each wearing point individually. Nothing is left to chance. As long as you can see oil in the sight glass you know that each part is being properly supplied.

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100% SAFETY AT SEA  
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Other devices may keep you afloat but cannot protect you from exposure—the cause of most deaths at Sea. Don't sail or let a loved one sail without an "Ever-Warm."

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It's up to the Regatta committee to see that the events take place smoothly and everything is properly handled.

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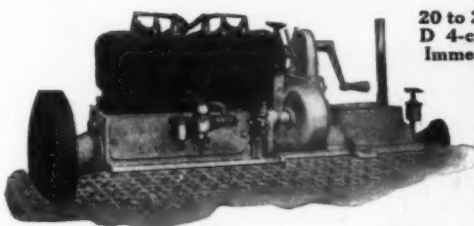
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*Largest Builders in the World of  
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20 to 24 H.P. model  
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Immediate Delivery

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Used in U.  
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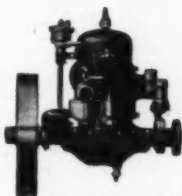
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Send today for big instructive catalog.

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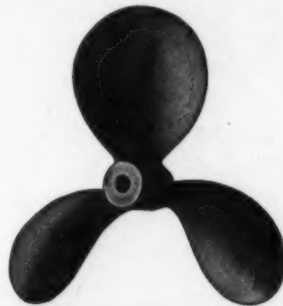


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The Great 2-Cylinder

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First National Bank Building, :: Chicago, Ill.

We solicit correspondence regarding license to man-  
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**"HVID ENGINES RUN ON ANY OIL WHICH FLOWS  
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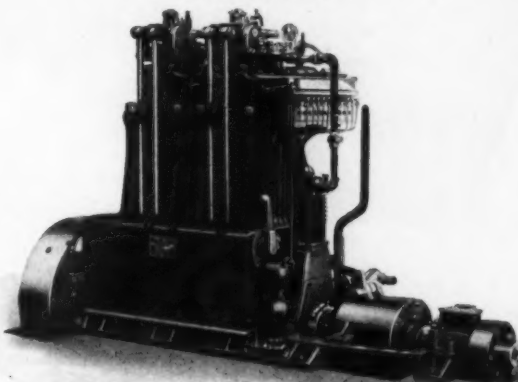
Highest fuel economy. Extreme simplicity.

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Thousands in use now in sizes from 1½ B.H.P. to 100  
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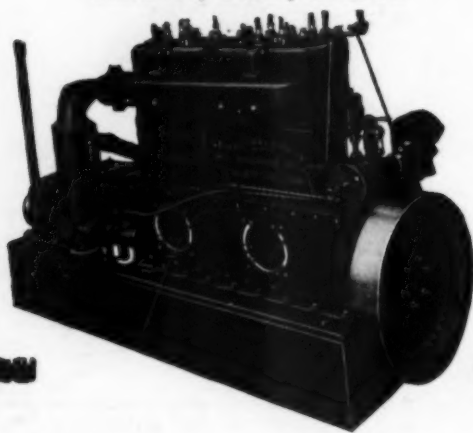
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36 Horse Power Bore, 4 1/4 inches Stroke, 8 inches

Quality construction throughout—in design, materials, workmanship, finish and equipment. Exceedingly compact for its power and exceedingly sturdy for its size.

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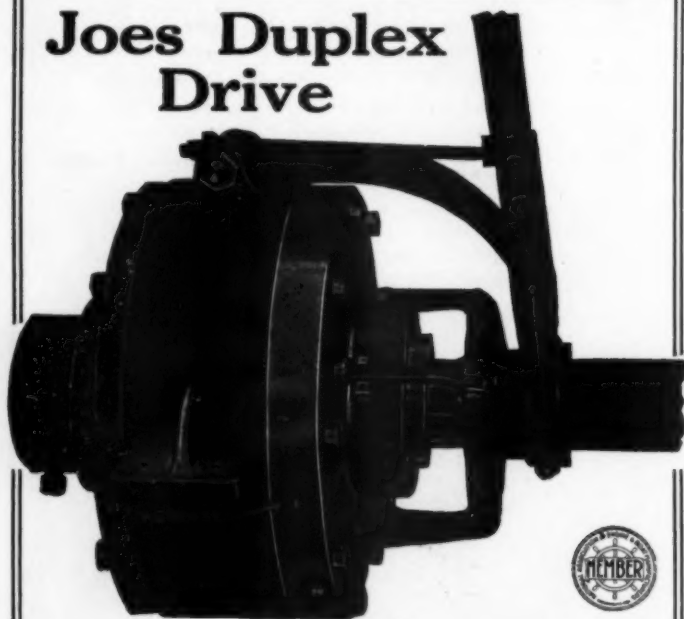
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### "Sands" Marine Sanitary Fixtures

We manufacture Marine Plumbing Fixtures for all kinds of vessels



#### The "Frisco"—Plate S-2046

(Design Patented—Copyrighted)

The "FRISCO" PUMP WATER CLOSET, extra heavy vitro-Adamant Oval Hopper Bowl. THREE (3) INCH supply and waste pump. All metal parts smoothed.

Plate S-2045 Polished oak seat, no cover

Plate S-2046 Polished oak seat with cover

Dimensions: Width, 34"; front to back, 31"; height, 17 1/4". Weight: Net, 80 lbs.; shipping, 150 lbs.

#### PLATE S-126

The "Glenora" Composition flat way sea cock.

Price

1/4 inch...\$2.25

1/2 inch...3.50

3/4 inch...5.25

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Sizes 2 1/4" and 3" also made.

We are revising our list prices. Write us for quotations.

#### "KNOCKABOUT"—PLATE S-34

(Patented—Copyrighted)

The "KNOCKABOUT" Improved Pump Water Closet. Vitro-Adamant round flushing rim bowl, 2 1/2-inch combined supply and waste pump; "Sands" Patent Automatic Safety Supply Foot Valves and "Sands" Patent Back-Water Check Valve.

Pump rough, finished trimmings, oak or mahogany seat and cover...

Mahogany seat and cover, add

Dimensions: Front to back, 19"; width, 17 1/4"; height, 14". Weight: net, 45 lbs. Shipping, 75 lbs.



PLATE S-750-A

New Style Double-Acting Brass Bilge Pump, with foot attachment and 5-ft. discharge and suction hose with brass strainer.

No. 1—1 1/4" diam., 15" long...\$5.00

No. 2—1 1/2" diam., 15" long...\$6.50

No. 3—2" diam., 24" long...\$14.00

We manufacture all Sanitary Fixtures required by U. S. Shipping Board for Emergency Fleet Corporation.



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Swing joint permits its different angles of Pulley prevents binding of rope.

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#### Plate 138 1/4-B

Cast Bronze Round Raised Strainer.

2 1/2".....\$0.35

3".....50

4".....65

5".....1.00

6".....1.50

7".....2.25

8".....3.00

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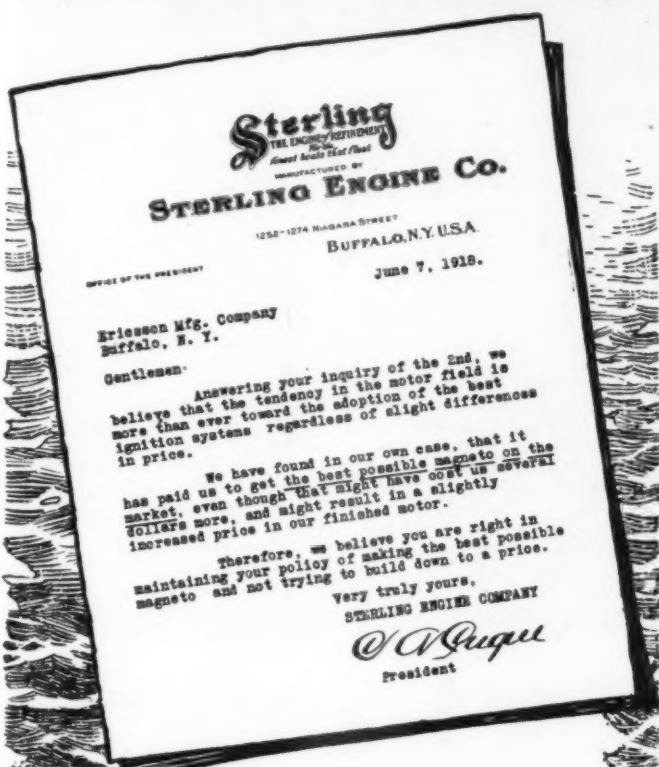
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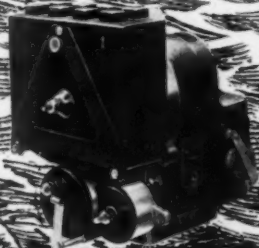
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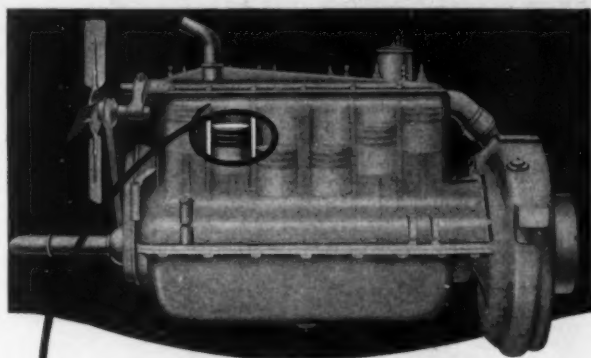


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Ericsson Mfg. Company  
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Piston rings at work are neither seen nor heard. Only by results can you determine their efficiency.

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## McQUAY-NORRIS LEAK-PROOF PISTON RINGS

Proved reliable by seven years of successful performance in developing higher motor efficiency. By installing them you are sure of definite results insofar as it is possible to govern them by piston rings. Increased compression—more power—less carbon trouble—economy of fuel and oil—motor protection.

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Order—and be sure you get—Genuine McQuay-Norris **LEAK-PROOF** Piston Rings. They will prove themselves to be the most truly economical and satisfactory piston rings money can buy.

## Why Better Piston Rings Mean Power and Economy

Send for our booklet—"To Have and To Hold Power." Clearly written—with diagrams—fully explaining the piston ring and power question. Every owner who desires greater efficiency and lower operating cost should read it. Judge for yourself which piston rings can be trusted out of sight in the vitals of your motor. Write Dept. B.

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**Self-Luminous  
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Valuable scientific information for Watch, Clock, Compass and Instrument Manufacturers, who use luminous dials. Tells you how to select material that will meet your particular needs economically, and points out mistakes to be avoided. Contents, in brief:

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### Seeing the Invisible

(Continued from page 21)

on the film so that with the aid of the stereoscope the proper perspective may be obtained. The most rapid movements of small insects can thus be reproduced with surprising detail.

The question naturally arises how can such minute fractions of time be measured. The sweep second hand of the most accurate stop watch would be a clumsy instrument for such work. The time between the exposures is measured by counting the vibrations of a tuning fork. The fork is placed before the camera so that the end of one of its prongs will appear in the photographs during the experiment. The fork used is usually one which gives fifty double vibrations per second. Now, by counting the number of images or pictures on the films which appear during one of its periods of vibration, or in one-fiftieth of a second, it is a simple matter to discover what fraction of time separates the pictures. If forty different pictures of the tuning fork are taken during one of its periods of vibration, it proves that forty times fifty pictures have been made, or exactly 2,000 in a single second. So expert do these scientists become that they can tell from the hum of the spark gaps, as the disk revolves, how many pictures are being taken to the second. A known musical note has a fixed number of vibrations, and the ear learns with practice to fix the position of a note in the musical scale with surprising accuracy.

In an interesting film taken of a fly launching itself in air some thirty different photographs were made between the time the fly started to rise and the moment it actually cleared the ground. It is very interesting to see just how its tiny wings beat the air and its legs were gathered together to make the spring. It would seem a very simple matter to swat any fly which was as deliberate as this one in getting away. As every one knows, the quickest movement of the hand proves slower than the jump of a fly. If these pictures were taken at the rate of 2,000 per second, the time required for the fly to clear the ground was just one-seventieth of a second. It is difficult to realize how small a fraction of time this really is. Set the shutter of your camera to one-fiftieth of a second and look through the lens as it flashes open and shut. Now imagine the speed of a camera which takes forty complete photographs in this period of time.

These experiments have shown that one of the most rapid movements in nature is the beat of a bee's wing in flight. It is impossible to catch this movement by an ordinary camera, and even when the exposures are made at the rate of 200 to the second the picture is blurred. By taking pictures at a speed of 2,000 a second every detail of this movement is reproduced. A bee which was released upside down before the camera, righted itself so rapidly that the eye could not follow it. The film showed that twenty pictures had been taken while the bee was reversing its position. In other words, the bee took just one-hundredth of a second to turn over. A "bee line" has always been synonymous with directness, but this is the first time the familiar phenomena has been photographed and analyzed.

### Safeguarding Life at Sea

(Continued from page 19)

Then, too, the lookouts at the bow and in the crow's-nest must be in communication with the navigating officer on the bridge. In case of danger they have but to press a button and the indicator on the bridge flashes the warning "danger ahead." The importance of this part of the signaling system may be more fully realized when it is considered that in a fog or even a very heavy rain it is impossible to see the bow of the ship from the bridge.

There is always present the danger of fire at sea, and to minimize the risk of modern ships are equipped with a most complete fire alarm system. This includes devices that give warning of a rise in the temperature in the various holds as well as alarm bells to call the crew to their fire station.

### On the Discovery of the Physical Cause of Magnetism

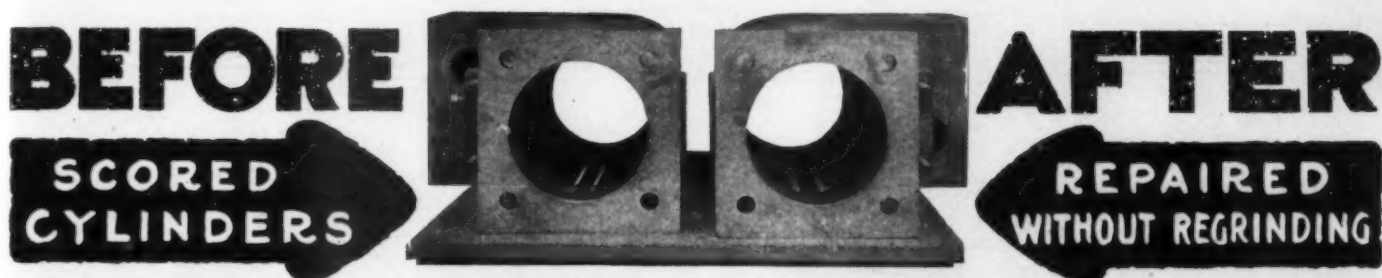
**M**AGNETISM has always been a puzzling problem to physicists. It acts across spaces and vacua, it throws out lines of force, and is generated by an electric current; on the contrary, it can be made to generate it. A magnetized body, such as an iron bar, will lose its magnetism if heated and allowed to cool, or even if struck a violent blow with a hammer. The cause for this has only lately been discovered. However, much remained mysterious concerning magnetism; and it is only lately that Prof. T. J. J. See, A. M., Ph. D., Sc. M., etc., has advanced a theory which, he asserts, fully explains the inner nature of magnetism, and solves all its riddles.

Says Professor See:—

"The electrodynamic waves propagated from magnets normal to the lines of force are flat, with motion of ether particles both longitudinal and transverse, exactly like that of waves in still water; and as these longitudinal waves travel only with the velocity of light, it follows that the ether does not vibrate as an incompressible elastic solid."

Professor See shows that this theory is in accord with all past researches, and even confirmed by them. The illustration will show one of these so-called "flat" waves; with inserts showing the cause of attraction and repulsion, at the poles of the magnet. These flat waves explain both magnetic attraction and repulsion, stresses in the medium, due to the rotations about the lines of force, which Maxwell treated of as far back as 1861, and Lord Kelvin in 1856.

As shown in the detailed illustration of plane wave motion, regular waves on still water are propagated by similar flat oscillations, or rotations of the particles around mean positions. If such waves be maintained steadily, the rotations of the fluid elements will be incessant.



## "Lawrence Patent Process"

Scored cylinders—no matter how badly scored—can be repaired as good as new, and at comparatively small cost, by the Lawrence Patent Process. New cylinder castings which show slight defects in the bore can be made as perfect as a flawless casting by this process.

Our expert workmen electrically fuse a silver-nickel alloy into the defects or scores. The bore of the cylinder is not enlarged; the standard piston and rings fit the same as when new. The compression is restored and our work is *guaranteed for the life of the motor*. Positively cannot harm the cylinders in any way.

We have repaired scored cylinders for some of the largest and most expensive marine and industrial engines in use today, as well as for hundreds of automobile motors, saving thousands of dollars for our customers. Several high grade motor and auto manufacturers are our regular patrons.

*Write today to our nearest service plant for full particulars and quotations on your work, stating size of cylinder and defect.*

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Applied to the dials of marine and aeronautic instruments it makes them visible at all times and in this connection Luma is rendering important war service. Meets fully the requirements of the British Admiralty and the specifications of the United States Government. Used by leading instrument manufacturers in this country and abroad.

Interesting literature will be mailed upon request.

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Cut collar costs! Save laundry bills!  
Evade the discomfort of wilting collars!  
Have a clean stiff collar always no matter  
how hot the day nor how strenuous your  
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never wilt because they are Py-ra-lin stif-  
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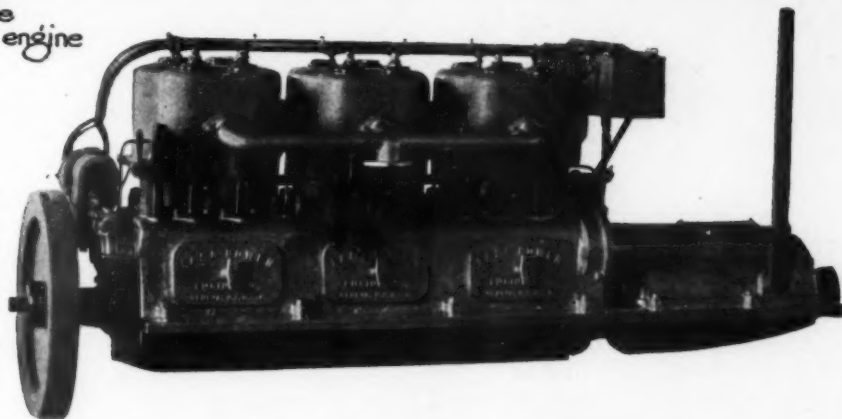
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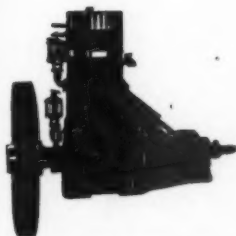
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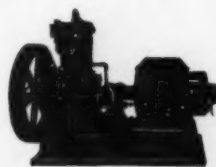


There are 17 years of continuous engine-building experience back of every Fay & Bowen Marine Engine that leaves our plant and each of these engines receives the same critical care in construction and final inspection that has characterized our product from the beginning.

Therefore we stand among the oldest and most successful designers and builders of marine engines in America and proof that Fay & Bowen Engines are giving the utmost in satisfaction is evidenced in the thousands now in all kinds of service throughout the world. We also build complete boats, independent lighting units, pumping sets, etc. Catalog?



FAY & BOWEN  
2-Cycle Engine



FAY & BOWEN

Independent electric light unit for cruisers, with bilge pump. Installed on many of the finest boats afloat.

FAY & BOWEN ENGINE CO  
104 LAKE ST., GENEVA, N.Y.  
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# Frisbie an' I

— we turn a heavy wheel on 1½ gallons of **KEROSENE** per hour!

**F**OR over a year, Capt. C. W. Bailey, 39 King St., Charleston, S. C., has been using a 3-cylinder, 25 H. P. Frisbie Motor with Frisbie kerosene equipment in the Albert, a 50 x 12 ft. freight boat. It turns a 26" x 32" Columbian wheel 400 R. P. M. on less than 1½ gallons of kerosene per hour. An especially good showing considering the resistance of this boat.

## Motor Paid For Itself In Fuel It Saved

"My fuel bills," says Capt. Bailey, "have proved that this motor has paid for itself in the difference between the cost of operation on kerosene over gasoline." The Frisbie Kerosene Motor is a *clean success*. Perfect lubrication. No excessive carbon trouble. No offensive odor. And about *half* the cost. Mr. Bailey says further: "This kerosene motor has driven my boat over 6000 miles, in which period I have not had to tighten a nut or spend one cent for repairs. In my estimation, the Frisbie Kerosene Motor is the best in the world."

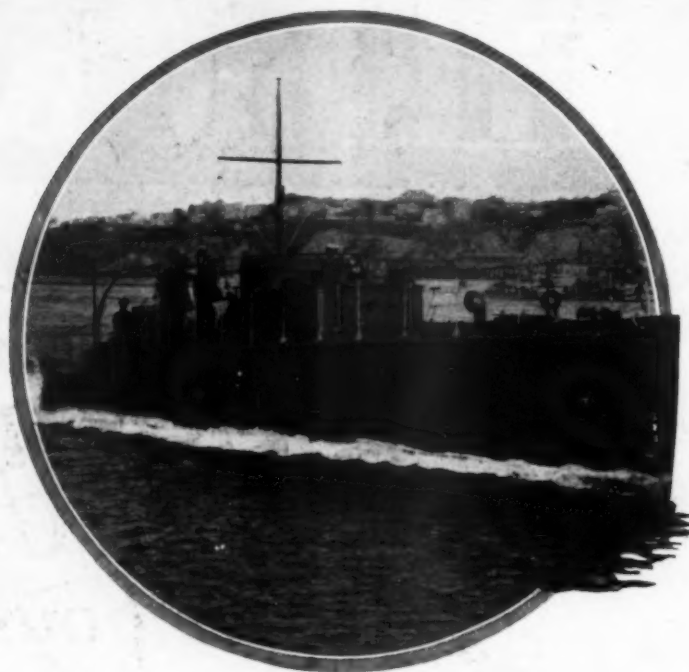
The Installation illustrated at the right handles either kerosene or gasoline or a mixture of both, graduated in any proportion. It has been used to run our own plant for a number of years. Just the installation to keep down your overhead in these times when every cent counts.

## Write for the Frisbie Book

containing the entire Frisbie line of motors from 1 to 6 cylinder, and ask for more details about the guaranteed kerosene equipment. Why burn high-priced gas when kerosene will do practically as much work and at a great deal less cost? Now's the time to get into kerosene economy!



**THE FRISBIE MOTOR COMPANY, 7 College St., Middletown, Conn.**



*One of the 550 Elco-built and Standard Engine powered British motor patrol boats all of which were equipt with Columbian Propellers.*

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We are exerting our every effort to take care of the business placed with us. All orders received are taken care of as promptly and as completely as our organization is capable of doing, commensurate with our unswerving insistence on the fulfillment of Government requirements AHEAD of everything. We ask your patriotic co-operation. Orders that call for stock goods, stock propellers, etc., of necessity receive better attention.

### Columbian Bronze Corporation

**Executive Offices: 50 Church Street, New York City**

**New York City Local Salesroom: Concourse, 50 Church Street**

**Factory: Freeport, L. I.**

**Address all correspondence to the Executive Offices except for New York City Sales**

# Sterling

THE ENGINE OF REFINEMENT  
For the  
finest boats that float

## The Fastest Boat of Her Type on the Pacific Coast



*Ding, the 22 mile, 51 x 10 footer owned by Dustin Farnum, the famous film star, is noted for her quiet running at high speed. She was designed and built by Fellows & Stewart, Wilmington, Cal., and is powered with twin Model FS, 6 cylinder Sterlings, bore 5½", stroke 6¾", developing 145 H.P. each at 1400 R.P.M.*

### What Mr. Farnum says of Ding:

"The engines are giving wonderful satisfaction. \* \* \* I can throttle them down so that the boat will barely move through the water, and shift the lever from forward to reverse, and back forward again, without the engines making one miss or stalling. \* \* \* My boat has turned out to be the fastest boat of its type on the Pacific Coast, and is a wonderfully sea-worthy craft. \* \* \* Have just bought, and am installing in my fishing boat, one of the Sterling, two cylinder, 12 H.P. motors."

The success of the Ding, and many other Sterling powered craft, is attributable to the fact that the Model F motors have been brought to a stage of perfection in the 1918 series.

Never an experiment, these 5½" bore motors have been further developed by careful observation while in over three years of actual service, and in practically every conceivable type of motor craft. We have adhered to the 5½" bore, 6¾" stroke, in both the racing motor and the Model F; so applying the knowledge we have gained in actual service that, by a constant process of development, we have improved our motors to a degree of exceptional efficiency.

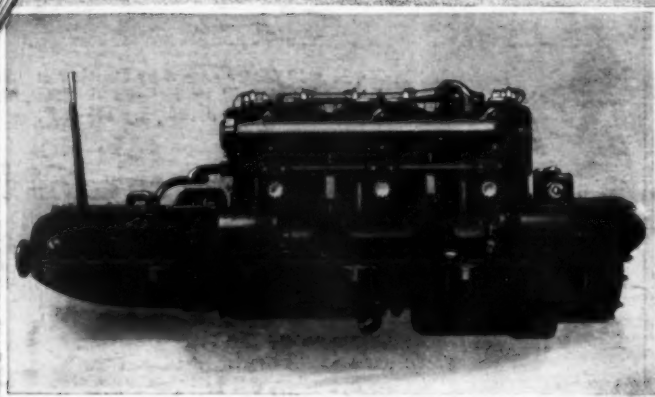
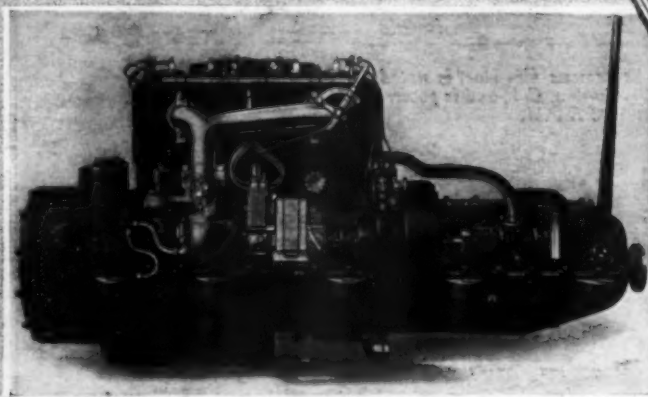
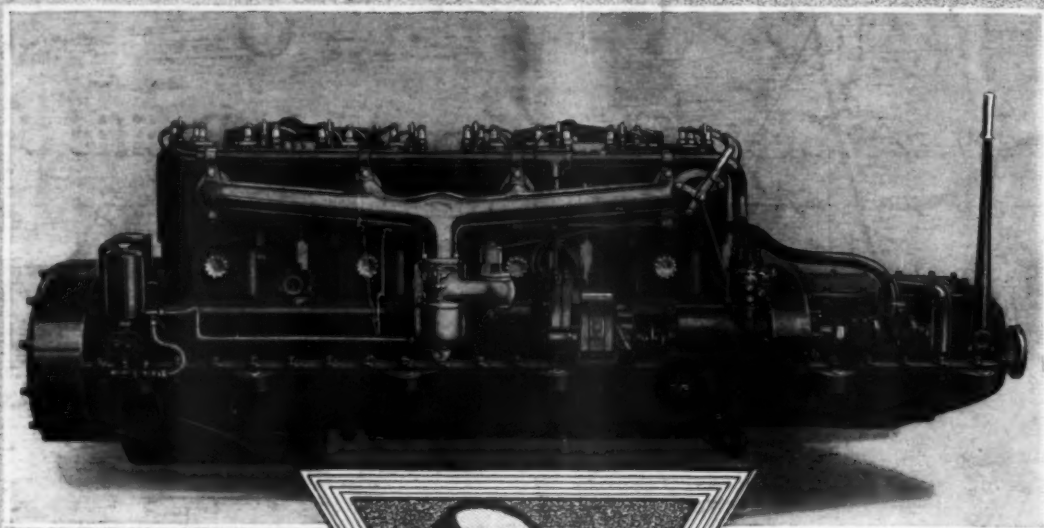
The Model F motors are built in 4, 6 and 8 cylinders, 25 to 300 H. P., in twin screw power plants up to 600 H. P.

## STERLING ENGINE COMPANY

1254 Niagara Street

Buffalo, N. Y.

*There are over 1000 Sterling powered craft in Navy and Patrol Service*



## THE BIG NEW THING AT THE SHOW

The big new thing at the recent New York Motor Boat Show was the exhibit of the NEW Van Blerck Engines. The first public showing of the Model "M" Van Blerck created wide interest, the Van Blerck Space was visited time and again by the enthusiasts. The new motors were such an improvement over any motor previously exhibited at a Motor Boat Show. The refinement of detail found throughout these new engines astonished even those familiar with Van Blerck designing and manufacturing ideals.

In conjunction with a slight change in cylinder size, several other important changes have been made. An absolute enclosing of all moving parts. The use of a DELCO Distributor in addition to a Berling two-spark magneto. A unique and highly efficient method of fuel feed and other equally important and radical changes that only a catalog can fully illustrate and explain. Write to-day for your copy.

Hereunder we supply the brief outline of the specifications:—

Model M-4, Bore 5 $\frac{1}{4}$ ", Stroke 6", 73 H. P. at 1000 R. P. M., 100 H. P. at 1500 R. P. M., \$2250.00

Model M-6, Bore 5 $\frac{1}{4}$ ", Stroke 6", 110 H. P. at 1000 R. P. M., 148 H. P. at 1500 R. P. M., \$3150.00

Model M-8, Bore 5 $\frac{1}{4}$ ", Stroke 6", 152 H. P. at 1000 R. P. M., 200 H. P. at 1500 R. P. M., \$4000.00

Just Three Engines for our 1918 production. A concentration of resources. Definite standardization of manufacturing methods. Equipment consists of Leece-Neville Two-Unit Electric Starter, entirely enclosed. Two complete and separate systems of ignition. One a Delco Battery System, the other a Berling Two-Spark Magneto System. Paragon Type Reverse Gear. A counterbalanced crankshaft with a bearing between each throw.

*If you did not see these engines at the Show, write for a description today.*

**VAN BLERCK MOTOR CO., 50 East 42nd St., New York City**

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